I N D E X

Measurement

Test 1 07
Test 2 10
Test 3 09
Test 4 17

Vectors & Equilibrium

Test 1 20
Test 2 23
Test 3 26
Test 4 29

Motion, Force, Work & Energy

Test 1 32
Test 2 35
Test 3 39
Test 4 43

Circular Motion

Test 1 47
Test 2 50
Test 3 53
Test 4 56

Fluid Dynamics

Test 1 59
Test 2 62
Test 3 65
Test 4 69

Waves & Oscilations

Test 1 71
Test 2 75
Test 3 79
Test 4 82

Optics

Test 1 86
Test 2 89
Test 3 92
Test 4 95

Heat & Thermodynamics

Test 1 98
Test 2 101
Test 3 104
Test 4 107

Electrostatistics

Test 1 110
Test 2 113
Test 3 116
Test 4 120

I N D E X

Current Electricity

Test 1	124
Test 2	127
Test 3	131
Test 4	135

Electromagnetism

Test 1	138
Test 2	141
Test 3	144
Test 4	147

Electromagnetic Induction

Test 1	150
Test 2	153
Test 3	156
Test 4	159

Test 1	162
Test 2	165
Test 3	169
Test 4	173

Physics Of Solids

Test 1	176
Test 2	179
Test 3	183
Test 4	188

Electronics

Test 1	192
Test 2	195
Test 3	199
Test 4	205

Modern Physics

Test 1	210
Test 2	214
Test 3	217
Test 4	220

Atomic Spectra

Test 1	224
Test 2	227
Test 3	230
Test 4	232

Nuclear Physics

Test 1	235
Test 2	239
Test 3	242
Test 4	246

MEASUREMENT

TEST-1

1. Measurement of 9.8 cm measured using a meter ruler calibrated up to mm may lie between?

- A: This is exact reading with no uncertainty.
- B: 9.7 to 9.8 cm
- C: 9.8 to 9.9 cm
- D: 9.75 to 9.85 cm

2. A precise instrument is the one which has?

- A: Less fractional uncertainty.
- B: Less absolute uncertainty.
- C: Less uncertainty.
- D: Less percentage uncertainity.

3. What is the SI unit for the amount of substance?

- A: There is no SI unit for amount of substance.
- B: Kilogram
- C: Meter
- D: Mole

4. Number of significant figures in 90,000 kg measured using an instrument of accuracy of 1 kg is?

- A: 1
- B: 2
- C: 5
- D: 4

5. Five Megabyte hard disk shall have how many bytes?

- A: $5 * 10^{6}$
- B: $5 * 10^{9}$
- C: $5 * 10^{12}$
- D: $5 * 10^{15}$

6. Which of the two readings is more precise, 23.8 from a meter ruler with least count of 0.1 cm 0.74 from a vernier caliper.

- A: 1
- B: 2
- C: None of the above.
- D: Need further information to answer this question.

7. If a= 10.4 $\pm$ 0.1 cm and b= 5.4 $\pm$ 0.1 cm a+b = ?

- A: 15.8 $\pm$ 0.2 cm
- B: 15.8 $\pm$ 0.1 cm
- C: 15.8 cm
- D: None of the above

8. What is the SI unit for Energy?

- A: Newton
- B: Joule
- C: Watt
- D: Pascal

9. Five Giga byte of hard disk will have how many bytes?

- A: $5 * 10^6$
- B: $5 * 10^9$
- C: $5 * 10^{12}$
- D: $5 * 10^{15}$

10. The SI standard of length is based on:

- A: The distance from the north pole to the equator along a meridian passing through Paris
- B: The speed of light
- C: Wavelength of light emitted by Hg198
- D: A precision meter stick in Paris

11. Dimension of solid angle is,

- A: 1
- B: M
- C: S
- D: 0

12. How many supplementary System International (SI) units do physical quantities have?

- A: 2
- B: 3
- C: 5
- D: 7

13. $5.0 \times 10^4 \times 3.0 \times 10^6 =$

- A: 1.5×10^9
- B: 1.5×10^{10}
- C: 1.5×10^{11}
- D: 1.5×10^{12}

14. What is the SI unit for thermodynamic temperature?

- A: Centigrade
- B: Heat
- C: Kelvin
- D: Fahrenheit

15. How many base System International (SI) units do physical quantities have?

- A: 8
- B: 7
- C: 6
- D: 5

16. Which are the dimension less quantities in the given formula. v=1/3 * pi r^2 h

- A: r^2
- B: 1/3
- C: pi
- D: 1/3 and pi

17. Relativistic mechanics is the branch of Physics that deals with,

- A: Solid State Mechanics
- B: Relative speed of objects
- C: Speed approaching light
- D: Mechanical instruments motion

18. There is no SI base unit for area because:

- A: An area has no thickness; hence no physical standard can be built
- B: We live in a three (not a two) dimensional world
- C: It is impossible to express square feet in terms of meters
- D: Area can be expressed in terms of square meters

19. In any equation dimension of physical quantity must be,

- A: Opposite on both sides of the equation.
- B: Negative on both sides of the equation.
- C: Same on both sides of the equation.
- D: None of the above.

20. How many significant figures are there in 900.05?

- A: 2
- B: 3
- C: 5
- D: None of the abov

TEST-2

1. Significant figure is defined as,

- A: Accuratey known digit + first doubtful digit
- B: Accuratey known digit + first two doubtful digits
- C: Accuratey known digit
- D: All doubtful digits

2. For power calculations x^3 uncertainity is calculated by?

- A: Multiply the absolute undertainty of x by 3.
- B: Divide the absolute undertainty of x by 3.
- C: Multiply the perentage undertainty of x by 3.
- D: Divide the percentage undertainty of x by 3.

3. What are the dimensions of gravitational constant G in the formula F=G * (m1 * m2) / r^2

- A: $M^{-1}L^3T^{-1}$
- B: $M^{-1}L^2T^{-2}$
- C: $M^{-1}L^3T^{-2}$
- D: ML^3T^{-2}

4. 2.2445 rounded off to two significant digits is?

- A: 2.0
- B: 2.1
- C: 2.3
- D: 2.2

5. Which of the following defines the work in terms of base units?

- A: Kg m s^{-2}
- B: Kg m^{-1} s^{-2}
- C: Kg m^2 s^{-3}
- D: Kg m^2 s^{-2}

6. What is the SI unit for Plane Angle?

- A: Radian
- B: Steradian
- C: Degree
- D: Meter

7. Which reading is more accurate,

1) 0.04 cm from vernier calipers
2) 0.002 cm from screw guage

- A: Not enough informaiton to answer the question
- B: Both have same accuracy
- C: 1
- D: 2

8. By changing your instrument which type of error is most likely to be affected?

- A: Random error.
- B: Systematic error.
- C: Both of them.
- D: None of the above.

9. Frequncy in terms of base units is,

- A: Hz
- B: $1/s^2$
- C: 1/s
- D: Frequncy is dimensionless unit.

10. If the product of muscle and speed equals power, what does muscle stand for?

- A: Force
- B: Power
- C: Energy
- D: Momentum

11. Dimensions of Power are,

- A: $M\,L^2\,T^{-2}$
- B: $M\,L^2\,T^{-3}$
- C: $M\,L\,T^{-2}$
- D: $M\,L^2\,T^{-1}$

12. Pico is,

- A: 10^{-15}
- B: 10^{-12}
- C: 10^{-9}
- D: 10^{-6}

13. Which reading is more accurate

1) 0.04 cm from a vernier calliper
2) 0.004 cm from a screw guage

- A: 1
- B: 2
- C: Both have same accuracy
- D: Not enought information to answer the question.

14. The length, breadth and thickness of a block are given as 'l' = 12 cm, 'b' = 6 cm and 't' = 2.45 cm. The volume of the block according to the idea of significant figures should be?

- A: 1×10^2 cm^3
- B: 2×10^2 cm^3
- C: 1.764×10^2 cm^3
- D: 1.83×10^2 cm^3

15. Dimension of energy efficiency is,

- A: 1
- B: $M L^2 T^{-2}$
- C: $M L^2 T^{-3}$
- D: None of the above.

16. Which of the following is not a base SI unit?

- A: Ampere
- B: Mole
- C: Pascal
- D: Kelvin

17. 465.48555 rounded off to 5 significant digits is?

- A: 465.50
- B: 465.49
- C: 465.480
- D: 465.48

18. ($5.348 * 10^2 \times 3.62 * 10^4$) / 1.336 = $1.45768982 * 10^3$. What is the right answer writeen in terms of significant figures?

- A: $1.45768982 * 10^3$
- B: $1.46 * 10^3$
- C: $1.458 * 10^3$
- D: $1.4 * 10^3$

19. Which of the following MOST ACCURATELY IDENTIFY the key elements of study under Particle physics?

- A: Molecules, atoms and sub-atomic particles
- B: Physical particles
- C: Changing form of particulate matter
- D: Sub-atomic particles

20. Dimentions of Volume are?

- A: m^3
- B: cm^3
- C: M^3
- D: L^3

TEST-3

1. Which of the following defines the Power in terms of base units?

- $Kg\ m\ s^{-2}$
- $Kg\ m^{-1}\ s^{-2}$
- $Kg\ m^2\ s^{-3}$
- $Kg\ m^2\ s^{-2}$

2. Femto is,

- A: 10^{-15}
- B: 10^{-12}
- C: 10^{-9}
- D: 10^{-6}

3. If F denotes force and t time, then in the equation $F = at^{-1} + bt^3$, the dimensions of a and b respectively are:

- A: LT^{-5} and LT^{-1}
- B: LT^{-1} and LT^{-5}
- C: MLT^{-5} and MLT^{-1}
- D: MLT^{-1} and MLT^{-5}

4. Which of the two derived physical quantities have same SI units?

- A: Force and Energy
- B: Force and Power
- C: Work and Energy
- D: Work and Power

5. Time period 'T' of a simple pendulum may depend on 'm', the mass of the bob, 'l', the length of the string and 'g', the acceleration due to gravity. This means that 'T' $\propto m^a l^b g^c$. What are the values of 'a', 'b' and 'c' respectively?

- A: 1/2, 0 and 1/2 respectively
- B: 1/2, 0 and - 1/2 respectively
- C: 0, 1/2, -1/2
- D: 0, 1/2, ½

6. a = 5.2 $\pm$ 0.1 and b = 0.84 $\pm$ 0.05
a / b = ?

- A: 6.2 $\pm$ 0.1
- B: 6.2 $\pm$ 0.5
- C: 6.2 $\pm$ 0.6
- D: 6.2 $\pm$ 0.05

7. If F denotes force and t time, then in the equation $F = at^{-1} + bt^2$, the dimensions of a and brespectively are,

- A: LT^{-4} and LT^{-1}
- B: LT^{-1} and LT^{-4}
- C: MLT^{-4} and MLT^{-1}
- D: MLT^{-1} and MLT^{-4}

8. Dimension of Plank's constant are same as that of?

- A: Work
- B: Magnetic Intensity
- C: Linear Momentum
- D: Angular Momentum

9. Match the physical constants in List I with their dimensional formulas in List II .

List-I	List-II
(1) Planck's constant	(A) $[ML^{-1}T^{-2}]$
(2) Gravitational constant	(B) $[ML^{-1}T^{-1}]$
(3) Bulk modulus	(C) $[ML^2T^{-1}]$
(4) Coefficient of viscosity	(D) $[M^{-1}L^3T^{-2}]$

- A: (1) - C, (2) - D, (3) - A and (4) - B
- B: (1) - B, (2) - A, (3) - C and (4) - D
- C: (1) - C, (2) - B, (3) - A and (4) - D
- D: (1) - C, (2) - D, (3) - B and (4) – A

10. Pick out the correct dimensions in length of the quantity $\mu_0\varepsilon_0$ from the following:

- A: 2
- B: 1
- C: -1
- D: -2

11. $a = 4.3 \pm 0.1$ and $b = 0.18 \pm 0.05$
$a * b = ?$

- A: 0.77 ± 0.1
- B: 0.77 ± 0.5
- C: 0.77 ± 0.2
- D: 0.77 ± 0.6

12. What is the SI unit for Electric Charge?

- A: Watt
- B: Coulomb
- C: Ampere
- D: Joule

13. While using measurement instruments, students are asked to repeat experiment over and over again to reduce effect of which type of error?

- A: Random error.
- B: Systematic error.
- C: Both of them.
- D: None of the above.

14. Which of the following defines the Electric charge in terms of base units?

- A: $J\ s^{-1}$
- B: A s
- C: N m
- D: C

15. What is the SI unit for Solid Angle?

- A: Degree
- B: Radian
- C: Kilogram
- D: Steradian

16. How many derived System International (SI) units Physical quantities can have?

- A: 2
- B: 7
- C: 11
- D: Infinite

17. How many derived System International (SI) units Physical quantities can have?

- A: 2
- B: 7
- C: 11
- D: Infinite

18. Van der Waals equation of state for real gases is $[P + (a / V^2)] * (V – b) = RT$ where P is the pressure, V is the volume of one mole of gas, R is the universal gas constant, T is the temperature and A and B are constants. The dimensional formula of a is,

- A: $[M^0L^6T^0]$
- B: $[ML^{-1}T^{-2}]$
- C: $[ML^5T^{-2}]$
- D: $[ML^{-2}T^{-2}]$

19. Conducting an experiment once using a faulty instrument is likely to be affected by which type of error?

- A: Random error.
- B: Systematic error.
- C: Both of them.
- D: None of the above.

20. f e, ε_0, h and c are electronic charge, electric permittivity, Planck's constant and velocity of light in vacuum respectively, what are the dimensions of $e^2/4\pi^2\varepsilon_0 hc$?

Hint: Dimentions of e= [AT]; ε_0= $[M^{-1}L^{-3}T^4A^2]$; h=$[ML^2T^{-1}]$; c=$[LT^{-1}]$

- A: $[M^0L^0T^0]$
- B: $[ML^0T^0]$
- C: $[M^0LT^0]$
- D: $[M^0L^0T]$

TEST-4

1. **Rounding off to three significant figures. Correct answer for 32.75 and 32.65 are,**
   - 32.7 & 32.6 respectively.
   - 32.7 & 32.7 respectively.
   - 32.8 & 32.7 respectively.
   - 32.8 & 32.6 respectively.

2. **Which of the following quantities is both units less as well as dimensionless?**
   - Angle
   - Solid Angle
   - Heat
   - Refractive Index

3. **Which of the following is dimensionless?**
   - Stress
   - Gas constant
   - Frequency
   - Efficiency of Engine

3. **Which one among the following quantities is a dimensional constant?**
   - Speed of light in free space
   - Viscosity of water
   - Ratio of specific heats of a diatomic gas
   - Force

4. **What is the SI unit for the intensity of light?**
   - Mole
   - Candela
   - Kelvin
   - Ampere

6. **Which of the following is a base unit?**
   - Radian
   - Newton
   - Mole
   - Watt

7. **If x= 24.3 $\pm$ 0.5 cm and y = 4.3 $\pm$ 0.1 cm**
   x - y = ?
   - 20.0 cm
   - 20.0 $\pm$ 0.6 cm
   - 20.0 $\pm$ 0.4 cm
   - None of the above

8. In a screw gauge, if the zero mark on the head scale is below the index line of the pitch scale, then the error is

- Positive
- Negative
- Infinite
- Zero

9. 1.513 + 27.3 =

- 29
- 28.8
- 28.9
- 28.813

10. Dimension of half life are,

- L
- T^{-1}
- T
- L^{-1}

11. Which of the following is not a base SI unit?

- Newton
- Meter
- Candela
- Mole

12. If a= 28.63 $\pm$ 0.1 cm and b= 2.31 $\pm$ 0.1 cm then a - b = ?

- 26.32 $\pm$ 0.2 cm
- 26.3 $\pm$ 0.2 cm
- 26.32 $\pm$ 0.1 cm
- 26.3 $\pm$ 0.1 cm

13. Number of significant figures in 5000 are?

- 1
- 3
- 4
- Depends on tthe Accuracy of the Measuring Instrument.

14. Which of the following is a derived unit?

- Ampere
- Candela
- Newton
- Mole

15. The dimension of coefficient of viscosity is given by:

- A: $[M^{-2}LT]$
- B: $[MLT]$
- C: $[ML^{-1}T^{-1}]$
- D: $[ML^{-1}T]$

16. Name the quantity which can be measured by using base unit "kgm^2s^{-3}":

- Weight
- Pressure
- Power
- Work

17. Length, mass, time, electric current, temperature, luminous intensity and amount of substance are called?

- International system
- Derived quantities
- Basic quantities
- Dimensions

18. Which one of the following prefixes give values in increasing order?

- Pico, Mega, Kilo, Giga
- Mega, Giga, Pico, Micro
- Mega, Giga, Pico, Kilo
- Pico, Micro, Mega, Giga

19. Number of significant figures in $2.100 * 10^{12}$ are?

- 2
- 3
- 4
- 12

20. When the dimensions of both sides of an equation are equal then the equation said to be:

- Simultaneous
- Homogeneous
- Instantaneous
- Quadratic

VECTORS & EQUILIBRIUM

TEST-1

1. What is the angle that the given vector makes with y- axis?

$A = 2\hat{i} + 2\sqrt{3}\hat{j}$

- A: 30^0
- B: 60^0
- C: 90^0
- D: 120^0

2. Cross product of two parallel vectors is?

- A: Null vector.
- B: A vector perpendicular to both the vectors.
- C: A vector parallel to both the vectors.
- D: A vector with a magnitude equal to the product of the magnitude of the two vectors.

3. In which quadrant the value of "tan θ" will be positive?

- A: First
- B: Second
- C: Third
- D: Both 1^{st} and 3^{rd}

4. If $\sum F$ acting on a body = 0. Then it is said to be in?

- A: Rotational Equilibrium
- B: Translational Equilibrium
- C: Motional Equilibrium
- D: None of the above.

5. i.j = ?

- A: 0
- B: 1
- C: -1
- D: k

6. Vector quantities have?

- A: Numerical properties.
- B: Directional properties.
- C: Both numerical and directional properties.
- D: Neither numerical nor directional properties.

7. The dimension of torque is?

- A: $[ML^{-2}T^{-2}]$
- B: $[MLT^{-2}]$
- C: $[ML^{2}T]$
- D: $[ML^{2}T^{-2}]$

8. The resultant of A + (-A) is called?

- A: Free vector
- B: Null vector
- C: Unit vector
- D: Position vector.

9. Direction of the unit vector $\hat{n}$ is along?

- A: X - axis
- B: Y - axis
- C: Z - axis
- D: Normal to a surface

10. i x i = ?

- A: i
- B: j
- C: k
- D: 0

11. The direction of vector product is given by?

- A: Head to tail rule
- B: Right hand rule
- C: Left hand rule
- D: None of the above.

12. Magnitude A x B of two vectors A and B is equal to?

- A: Triangle formed with two adjacent sides A and B.
- B: Parallelogram formed with two adjacent sides A and B.
- C: Parallelopiped formed with two adjacent sides A and B.
- D: None of the above.

13. A vector in three dimensional Spaces is completely defined by how many number of components?

- A: One
- B: Two
- C: Three
- D: Infinite

14. The cross product i x j is equal to?

- A: Zero
- B: - j
- C: - k
- D: k

15. A body will be in complete equilibrium only if?

- A: $\sum F = 0$
- B: $\sum \tau = 0$
- C: $\sum F = 0$ and $\sum \tau = 0$
- D: Due to presence of the force of gravity it is impossible to have a body in equilibrium.

16. Torque is defined as?

- A: Turning effect of force.
- B: Cross product of force and position vector relative to pivot.
- C: Cross product of force and moment arm
- D: All of the above.

17. Rectangular coordinate system is also called?

- A: Polar coordinate system
- B: Cartesian coordinate system
- C: Cylindrical coordinate system
- D: Space coordinate system

18. The direction of a vector in space is specified by?

- A: One angle
- B: Two angles
- C: Three angles
- D: Four angles

19. In which quadrant the two rectangular components of a vector have same sign?

- A: 1^{st}
- B: 3^{rd}
- C: 4^{th}
- D: Both 1^{st} and 3^{rd}

20. Dot product of (i + j + k) and (i - j + k) is?

- A: 0
- B: 1
- C: -1
- D: 2

TEST-2

1. If ā = ƃ then the value of triple scalar product ā.(ƃ x ā) is?

- A: 0
- B: 1
- C: -1
- D: ā.ƃ

2. Two vectors A and B make angle Ө with each other. The projection of vector B along vector A is?

- A: A.B / A
- B: A.B / B
- C: A cos Ө
- D: B sin Ө

3. Two vectors are A = 3i^ + 2j^ - k^ and B = -3i^ - 2j^ + k^, then ?

- A: A and B have same magnitude.
- B: B is negative vector of A.
- C: A has positive magnitude while B has negative magnitude.
- D: Both A and B

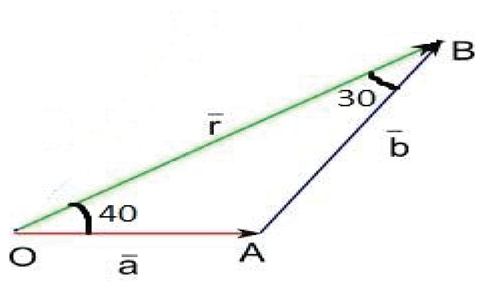
4. If vector A is 3 units south and vector B is 3 units west. Then A x B is?

- A: 9 units upwards
- B: 9 units downwards
- C: 1 unit upwards
- D: 1 unit downwards

5. If A x B = C, then the angle between A and C is? A,B and C are all vectors.

- A: 0^o
- B: 60^o
- C: 90^o
- D: Cannot determine with the given information.

6. What is the angle between vectors A And B in the figure below?



- A: 70^o
- B: 110^o
- C: 120^o
- D: 40^o

7. A room has dimensions 10m * 12m * 14m. The Iron Man start from one corner of the room and flies to the diametrically opposite corner of the room. The magnitude of his displacement is?

- A: 17 m
- B: 21 m
- C: 25 m
- D: 29 m

8. Given : $\vec{A} = \hat{i} + 2\hat{j} - 3\hat{k}$. When a vector $\vec{B}$ is added to $\vec{A}$, we get a unit vector along X-axis. Then, $\vec{B}$ is

- A: -2j + 3k
- B: 2j + 3k
- C: -j - 3k
- D: j - 3k

9. Direction cosines of i + j + k are?

- A: 1,1,1
- B: 2,2,2
- C: √2,√2,√2
- D: 1/√3, 1/√3, 1/√3

10. The angle between A x B and B x A is?

- A: 0^o
- B: 90^o
- C: 180^o
- D: 270^o

11.Which of the following is not a defined quantity?

- A: i.i / k.k
- B: i.j / j.j
- C: i.i / i.k
- D: All of them are defined quantities.

12.A × B ≠ B × A because?

- A: Their direction is different.
- B: Their magnitude is different.
- C: Their direction and magnitude both are different.
- D: No two cross products are same.

13. If F_x and F_y are the rectangular components of a vector such that F_x = -ve and F_y = -ve. The angle the vector makes with x axis is?

- A: Between 0^o and 90^o.
- B: Between 90^o and 180^o.
- C: Between 180^o and 270^o.
- D: Between 270^o and 360^o.

14. If A .B = 0 and A × B = 0 then which of the following is true?

- A: A and B are parallel.
- B: A and B are perpendicular.
- C: Either A or B or both are null vectors.
- D: A and B are opposite to each other.

15. The value of 2i x 4k =?

- A: 0
- B: 8k
- C: -8j
- D: 8j

16. If vector A is 2 units north and vector B is 8 units east. Then B x A is?

- A: 16 units upwards
- B: 16 units downwards
- C: 16 units westwards.
- D: 16 units southwards.

17. Torque has maximum value if the angle between F and r is?

- A: 0^o
- B: 45^o
- C: 90^o
- D: 180^o

18. i x k = ?

- A: 0
- B: j
- C: - j
- D: 1

19. The work done in moving an object a long a straight line from (3,2,-1) to (2,-1,4) in a force field which is given by F=4i – 3j + 2k, is

- A: 45
- B: 35
- C: 25
- D: 15

20. What is the unit vector for v = 3i - j + 2k?

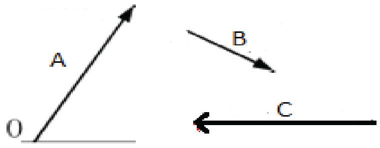
- A: [3/√14 , 1/√14, 2/√14]
- B: [5/√37 , -2/√37, 7/√37]
- C: [1/√37 , 8/√37, -3/√37]
- D: [3/√14 , -1/√14, 2/√14]

TEST-3

1. If F = 2i + 3j - 4k and D = i - 2j - 5k then work done is equal to?

- A: 28 J
- B: -24 J
- C: -8 J
- D: 16 J

2. Three force A, B & C are shown in the figure below. If these forces are acting on a point then the resultant force shall be along?



- A: + x axis
- B: - x axis
- C: + y axis
- D: - y axis

3. Two forces each of magnitude P/2 act at right angle to each other. Their effect may be neutralized by a third force along their bisector in the opposite direction with a magnitude of?

- A: P
- B: P/2
- C: $\sqrt{2}P$
- D: $P/\sqrt{2}$

4. If C = A + B and magnitude of A, B and C is 12, 5 and 13 respectively. The angle between A and B is? (A, B and C are all vectors)

- A: 0^o
- B: 45^o
- C: 90^o
- D: 180^o

5. Vector A = 2i + 4j - 3k and vector B= 4i + 8j - 6k. Then vector A and B are?

- A: Perpendicular
- B: Parallel
- C: Anti-parallel
- D: None of the above.

6\. Fig. 1 shows the directions and lines of action of two forces applied to a circular disc.

Which one of the arrows in Fig. 2 best represents the line of action of the resultant force?

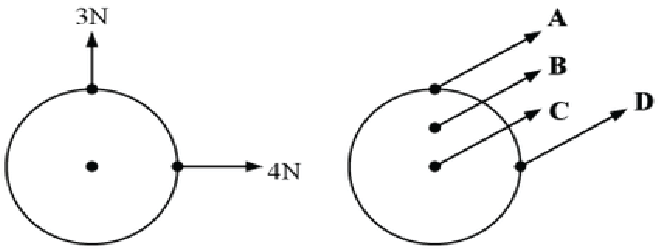


Fig. 1 Fig. 2

- A: A
- B: B
- C: C
- D: D

7. Which one of the following is not correct for a vector A = √2 i^ + √2 j^ ?

- A: It has the direction angle of 45 with the x- axis
- B: Has magnitude of 2
- C: Has magnitude of √2
- D: Its component along z axis is zero.

8. The sum and difference of two perpendicular vectors of same magnitude are?

- A: At acute angle with each other.
- B: At obtuse angle with each other.
- C: Parallel to each other.
- D: Perpendicular to each other

9. If vector A and vector B have magnitude a and b respectively. The magnitude of cross product of two vectors cannot be?

- A: Equal to zero.
- B: Less than ab.
- C: Equal to ab.
- D: Greater than ab.

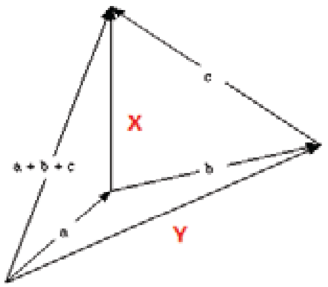
10. If the magnitude of dot product and cross product of two vectors is 6√3 (6 underoot 3) and 6 respectively. The angle between the vectors is?

- A: 75^o
- B: 60^o
- C: 45^o
- D: 30^o

11. (2j x 3i).k = ?

- A: 0
- B: 7
- C: 6
- D: -6

12. X and Y is the figure below is?



- A: X = b + c and Y = a + b
- B: X = a + c and Y = a - b
- C: X = b and Y = a
- D: X = b - c and Y = a + b

13. **Two vectors $\vec{A}$ and $\vec{B}$ are such that $\vec{A}+\vec{B}=\vec{C}$ and $A^2 + B^2 = C^2$. Which of the following is correct ?**

- A: Vector A is parallel to vector B.
- B: Vector A is anti-parallel to vector B.
- C: Vector A is perpendicular to vector B.
- D: Vector A has same magnitude as vector B.

14. $(A.B)^2 + |A \times B|^2$ = ? where A and B are both vectors.

- A: 0
- B: A^2B^2
- C: AB
- D: $(AB)^{1/2}$

15. Which one is not a correct relation?

- A: A x B = - B x A
- B: IA x BI = - IB x AI
- C: A x B = AB sin θ
- D: i x i = 0

16. Two forces 5 N and 7 N are acting on a point. Which of the following cannot be their resultant force?

- A: 1 N
- B: 3 N
- C: 7 N
- D: 11 N

17. Which of the following position vectors have same magnitude?
a = 3i - 4j +2k
b = -3i + 4j -2k
c = 2i + 4j + 3k

- A: a and b
- B: a and c
- C: All have same magnitude.
- D: None of the has same magnitude.

18. If A x B = 0 and B x C = 0 then A x C = ? (A, B and C are all vectors)

- A: Zero
- B: AB sin Θ
- C: AC cos Θ
- D: AC tan Θ

19. If l, m and n are the direction cosines of a vector then?

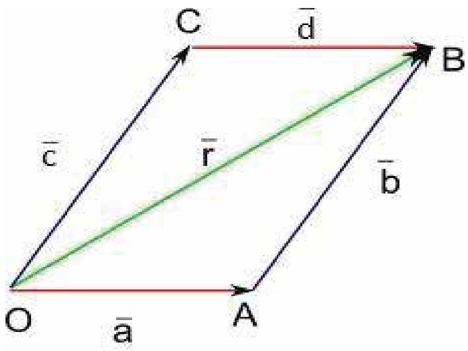
- A: l + m + n = 1
- C: lmn = 1
- B: $l^2 + m^2 + n^2 = 1$
- D: 1/l + 1/m + 1/n = 1

20. The magnitude of vector product of two vectors is √3 times their scalar product. The angle between the vectors is?

- A: π/2
- C: π/4
- B: π/3
- D: π/6

TEST-4

1. Which of the following is true about the given vector diagram?



- Vector a = Vector b
- Vector r = Vector a - Vector b
- Vector a ≠ Vector b ≠ Vector c ≠ Vector d
- Vector a = Vector d and Vector b = Vector c

2. If vector A is vertically downwards and vector B is directed along north. The direction of B x A is?

- East
- North
- West
- South

3. Three forces (2i - 3j + 4k), (8i - 7j + 6k) and m(i - j + k) are in equilibrium. The value of m is?

- 10
- 20
- -10
- -20

4. If A = B + C and B = C + A then C = ? (A, B and C are all vectors).

- A + B
- B
- A
- Null Vector.

5. k.k = ?

- 0
- 1
- -1
- j

6. A unit vector can be obtained by dividing the vector with?

- Itself
- Its perpendicular vector.
- Null vector
- Its Magnitude.

6. **Two forces 4i N and 3j N are acting on a point. What is the value of force required to keep them in equilibrium? Hint: $\tan^{-1} 3/4 = 37^o$.**

- 5N at angle 37^o with y axis
- 5N at angle 217^o with y axis
- 5N at angle 37^o with x axis
- 5N at angle 217^o with x axis

8. A vector is represented by (i + 2j - 5k). Its length in xy plane is?

- √5
- √39
- √26
- √29

9. If vector A is 3 units north and vector B is 9 units south. Then A x B = ?

- 27 units upwards
- 9 units upwards.
- 27 units Downwards.
- None of the above.

10. The resultant of two forces of equal magnitudes is also equal to the magnitude of the forces. The angle between the two forces is?

- 30^0
- 90^0
- 60^0
- 120^0

11. | ē | can be written as?

- $(\bar{e}.\bar{e})^{1/2}$
- ē.ē
- ē
- $(\bar{e}.\bar{e})^2$

12. If line of force passes through the axis of rotation, the moment arm is

- 0
- 1/2r
- r
- 2r

13. Which of the following conditions must satisfy for rotational equilibrium?

- $\sum \tau = 0$
- $\sum F = 0$
- $\sum F = 0$ and $\sum \tau = 0$
- $\sum F = +ve$ and $\sum \tau = -ve$

14. The angle between z axis and the vector i + j + √2k is?

- 30^o
- 45^o
- 60^o
- 90^o

15. Which of the following shows one vector and one scalar quantity?

- Force : Momentum
- Velocity : Acceleration
- Work : Mass
- Momentum : Work

16. S.I unit of torque is ?

- N.m
- J
- N/m
- Js

17. The magnitude of cross product is equal to the dot product between the two. The angle between the two vector is?

- 30^0
- 45^0
- 60^0
- 180^0

18. Value of k . (i x j) is equal to?

- 1
- -1
- √-1
- j

19. Two vectors are equal if they have?

- Same magnitude.
- Same direction.
- Same magnitude and direction.
- Same magnitude, direction and position of initial points.

20. Addition of vectors obeys which of the following law/laws?
i. Commutative law
ii. Associative law

- i only.
- ii only
- Both i and ii.
- Neither i nor ii.

MOTION ,FORCE,WORK & ENERGY

TEST-1

1. **A ball a with mass 10g moving with a velcoity of 8 m/s towards north collides with a ball b of 1000 kg at rest. If the collision is perfectly elastic what is velocity of two balls after collision?**

- A: a = 8 m/s north, b= 0 m/s
- B: a = 8 m/s south, b= 0 m/s
- C: a = 6 m/s north, b= 1m/s north
- D: a = 6 m/s south, b= 1m/s north

2. **Work done will be maximum if the angle between the force F and displacement d is,**

- A: 90
- B: 45
- C: 180
- D: 0

3. $\lim_{\Delta t \to 0} \Delta d / \Delta t$ **for a body moving with zero acceleration is?**

- A: Increasing
- B: Decreasing
- C: Constant
- D: Zero

4. **Formula for absolute potential energy is?**

- A: -GMm / R
- B: GMm / R
- C: -GMm / R*r
- D: GMm / R*r

5. **A professional golfer strikes a golf ball with his driver, imparting a momentum of 8 kg· m/s on the ball. The golf ball strikes a wall and maintains contact for .0025 seconds before it bounces straight backward at the same velocity with which it struck the wall. The momentum of the golf ball is**

- A: 6400 kg·m/s
- B: 3200 kg·m/s
- C: 8 kg·m/s
- D: .02 kg·m/s

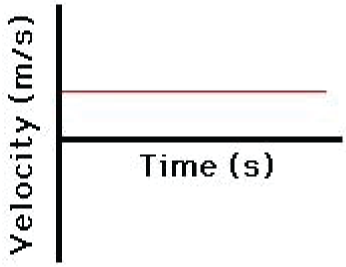
6. **A total of 4,900 J. was expended in lifting a mass of 50 kg. The mass was raised to a height of**

- A: 4 m
- B: 9.8 m
- C: 20 m
- D: 22.5 m

7. **When force causes a displacement in its own direction,**

- A: No work is done
- B: Energy is generated
- C: Work is done
- D: Work and energy are generated

8. **The graph below has,**



- A: Zero velocity, Zero acceleration
- B: Positive velocity, Zero acceleration
- C: Zero velocity, Positive acceleration
- D: Positive velocity, Positive acceleration

9. **A train traveling with a velocity of 72 km / hour comes to rest in 40 sec, after the brake is applied. What is the acceleration of the train?**

- A: -1 m/s^2
- B: -2 m/s^2
- C: -1/2 m/s^2
- D: 1/2 m/s^2

10. **An air craft has a take off velocity of 100 meters per second and the acceleration of air craft is 2.5 meters per second. In how many seconds will the aircraft take off?**

- A: 4 s
- B: 50 s
- C: 40 s
- D: 5 s

11. **Four bodies A, B, C and D having masses 50 kg, 100 kg, 200 kg and 300 kg respectively are subjected to the same force of 100 N. Which one achieves the highest acceleration?**

- A: A
- B: B
- C: C
- D: D

12. **A force of 60 N is applied on a body at an angle of 60° with a horizontal, and displaces it through 5 m along horizontal. What is the work done?**

- A: 50 J
- B: 150 J
- C: 100 J
- D: 300 J

13. **Bullet of mass 10g moves with a velocity of 100 m/s after being fired by a gun weighing 5 kg. The recoil velocity of the gun would be?**

- A: 200 m/s
- B: 0.2 m/s
- C: 20 m/s
- D: 2 m/s

14. Two spheres of same size, one of mass 2 kg and another of mass 4 kg; are dropped simultaneously from the top of a Minar (height = 72 m). When they are 1 m above the ground, the two spheres have the same,

- A: Momentum
- B: Kinetic Energy
- C: Potential Energy
- D: Acceleration

15. Flowing water has which kind of energy?

- A: Potential energy
- B: Water enerty
- C: Electric energy
- D: Kinetic energy

16. Solar energy at normal incidence outside the earth's atmosphere is about?

- A: 2.3 KW/m^2
- C: 0.9 KW/m^2
- B: 4.6 KW/m^2
- D: 1.4 KW/m^2

17. When a force is parallel to the direction of motion of the body, then work done on the body is,

- A: Minimum
- C: Zero
- B: Maximum
- D: Infinite

18. A man takes 30 seconds to lift a mass 'm' kg through 1 m height. The second man takes 60 sec to lift the same mass through the same height. The ratio of work done by these men will be,

- A: 1:2
- B: 1:1
- C: 4:1
- D: 2:1

19. A body of mass 5 kg is placed at the origin, and is constrained to move only on the x-axis. A force of 10 N is acting on it in a direction making an angle of 60° with the x-axis and displaces it along the x-axis by 4 metres. The work done by the force is

- A: 60 J
- B: 20 J
- C: 7.25 J
- D: 2.5 J

20. A goldfish swims through an aquarium by moving its fins and tail. What causes the fish to move forward?

I. The force the water exerts on the goldfish

II. The force the tail of the goldfish exerts on the water

III. The force the fins of the goldfish exert on the water

1. A: I only
2. B: II only
3. C: II and III only

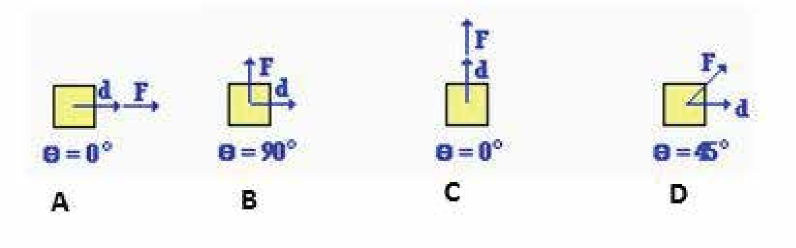
D: I, II, and III

TEST-2

1. **A ball (b1) of mass 70g collides with a ball (b2)of mass 140g. Initial velocity of the first ball is 9 m/s while the second ball is at rest. What would be velocity of two balls if the collision is perfectly elastic?**

   - A: b1= 6 m/s, b2= 3m/s
   - B: b1= -6 m/s, b2= 3m/s
   - C: b1= 6 m/s, b2= -3m/s
   - D: b1= -3 m/s, b2= 6m/s

2. **If F and D are equal, which of the following would have highest amount of work done,**



   - A: A
   - B: D
   - C: A & C
   - D: C

3. **Escape velocity of 10 KG ball with relation to escape velocity of 5 KG ball would be?**

   - A: Twice
   - B: Half
   - C: Four times
   - D: Same

4. **An aeroplane is flying horizontally with a velocity of 600 km/h at a height of 1960 m. When it is vertically above a point 'A' on the ground, a bomb is released from it. The bomb strikes the ground at point 'B'. The distance 'AB' is:**

   - A: 1200m
   - B: 3.33 km
   - C: 0.33 m
   - D: 333.3 km

5. **An electric pump is used to fill an overhead tank of capacity 9 m^3 kept at a height of 10 m above the ground. If the pump takes 5 min to fill the tank by consuming 10 kW power, the efficiency of the pump should be (Take g = 10 ms^{-2}),**

   - A: 60 %
   - B: 40 %
   - C: 30 %
   - D: 20 %

6. **A metro train starts from rest, and in 5 sec travels 108 km/h. After that, it moves with constant velocity, and comes to rest after travelling 45 meter with uniform retardation. If the total distance travelled is 395 meter, find the total time of travelling.**

   - A: 12.2 s
   - B: 15.3 s
   - C: 9 s
   - D: 17.2 s

7. A man raises 10 bricks to the top of a building by going up along a vertical spiral staircase in 5 minutes. A boy raises 10 bricks to the top of the building by going up a slanting ladder in 10 minutes then:

- A: Man does more work than boy
- B: Boy does more work than man
- C: None of them has done any work
- D: Both of them have done same amount of work

8. A body having weight 20N. What will be the tension T if the elevator is decending with a= 0.1ms^{-2} .

- A: 196N
- B: 19.8N
- C: 1.98N
- D: 2N

9. Propellor of the boat exerts a constant force of 5N and causes the boat to move with a velocity of 5 m/s. The power delivered by the motor is?

- A: We need information on the time travelled to calculate power.
- B: 25 Watts
- C: 25 K watts
- D: 10 Watts

10. A body constrained to move in the y-direction is subjected to a force F=2i+15j+6k N. The work done by this force in moving the body through a distance of 10 m along y-axis is,

- A: 100 J
- B: 150 J
- C: 120 J
- D: 230 J

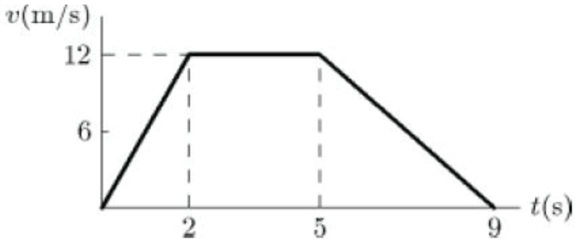
11. Absolute potential energy of 10 KG ball with respect to 5 KG ball would be?

- A: Twice
- B: Half
- C: Same
- D: Four times

12. A ball b1 with mass 5000kg collides with a ball b2 with mass 10g. Ball m1 had initial velocty of 9 m/s while b2 was a rest. What are their respective velocity (v1 and v2) after collision assuming that collision was perfectly elastic?

- A: v1= 9 m/s, v2= 1 m/s
- B: v1= 9 m/s, v2= 18 m/s
- C: v1= 9 m/s, v2= 9 m/s
- D: v1= 8 m/s, v2= 1 m/s

13. In the graph below, how much the car travels between 2s and 5s?



- A: 12
- B: 24
- C: 36
- D: 60

14. If the velocity of the body thrown in projectile is increase by three times, the range shall?

- A: Increase by 3 times
- B: Increase by 4.5 times
- C: Increase by 9 times
- D: Increase by 6 times.

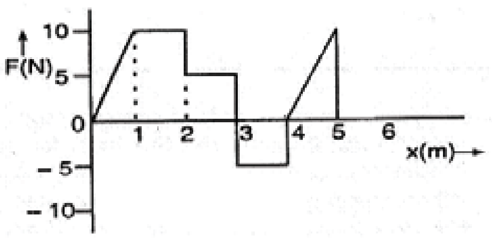
15. A body of mass 5 kg is dropped from a height of 2 m. If the acceleration due to gravity is 10 ms^{-2}, the kinetic energy of the body just before, it strikes the ground is

- A: 100 J
- B: Slightly more than 100J
- C: 95 J
- D: 50 J

16. An astronaut is standing on an asteroid when he accidentally drops a wrench. He observes that the gravitational acceleration on the asteroid is 2.4 m/s^2. If he had thrown the wrench at an upward angle instead, he would have found the gravitational acceleration on the asteroid to be

- A: less than 2.4 m/s^2
- B: toward him at 2.4 m/s^2
- C: downward at 2.4 m/s^2
- D: greater than 2.4 m/s^2

17. The relationship between the force F and position x of a body is as shown in the figure. The work done in displacing the body from x = 0 m to x = 5 m will be,

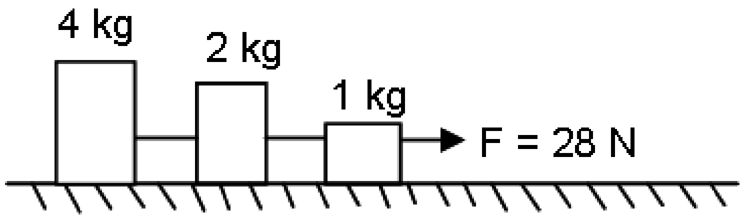


- A: 15 J
- B: 20 J
- C: 25 J
- D: 30 J

18. Slope of work time graph is equal to?

- A: Velocity
- B: Acceleration
- C: Energy
- D: Power

19. In the arrangement shown in the figure below, the strings are light and inextensible. The surface over which blocks are placed is smooth. What is the acceleration of each block?



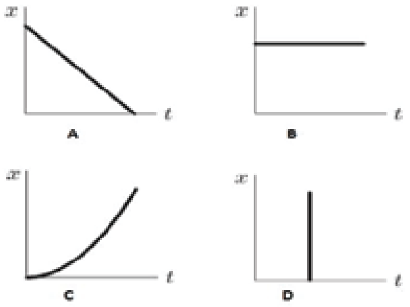
- A: 8 m/s^2
- B: 4 m/s^2
- C: 2 m/s^2
- D: 12 m/s^2

20. $\int_{t1}^{t2} F\, ds$ **Gives?**

- A: Force
- B: Kinetic Energy
- C: Work Done
- D: Momentum

TEST-3

1. **Which of the following graph shows the motion of an object moving with constant non zero speed?**



2. **10000 small balls, each weighing 1g, strike one square centimeter of area per second with a velocity 100 m/s in a normal direction and rebound with the same velocity. The value of pressure on the surface will be**

   - $2 * 10^3$ N/m^2
   - $2 * 10^5$ N/m^2
   - $2 * 10^7$ N/m^2
   - $2 * 10^9$ N/m^2

3. **Velocity of an object is given by the formula $v=4t-3t^2$. Where v is in m/s and t is in s. What is the average velocity over time interval 0 to 2s?**

   - 0 m/s
   - 2 m/s
   - -2 m/s
   - 4 m/s

4. **A particle experiences constant acceleration for 6 sec after starting from rest. It travels a distance S1 in the first 2 sec, distance S2 in the next 2 sec, and a distance S3 in the last 2 sec. Then, S1 : S2 : S3 will be equal to?**

   - 1 : 1 : 1
   - 1 : 3 : 5
   - 1 : 2 : 3
   - 1 : 5 : 9

5. **The displacement of a particle is given by $s = a_0 + \frac{a_1 t}{2} - \frac{a_2 t^2}{3}$. What is its acceleration? Given a_0, a_1, a_2 are all positive.**

   - Negative
   - All zero
   - Positive
   - a_2

6. **A car moving with a speed of 50 m/s, can be stopped by brakes after at least 6 m. If the same car is moving at a speed of 100 m/s, the minimum stopping distance is**

   - A: 12 m
   - B: 18 m
   - C: 24 m
   - D: 6 m

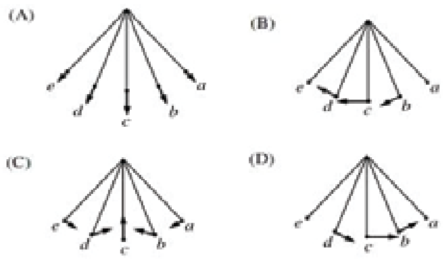
7. The momentum of a body increase by 20% - What is a percentage increase in its kinetic energy ?

- A: 36 %
- B: 44 %
- C: 52 %
- D: 60 %

8. A car is moving with a velocity of 25 m/s north and has an acceleration of 3 m/s^2 south. What would be car's velocity after 6 secs?

- A: 7 m/s South
- B: 7 m/s North
- C: 43 m/s North
- D: 20 m/s South

9. Which of the following figures show the acceleration of pendulum bob at point a through e in the figure below?

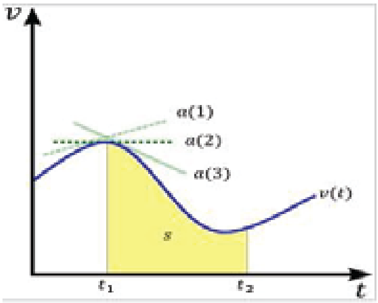


- A: A
- B: B
- C: C
- D: D

10. The engine of a train crosses an electric pole with velocity 'u', and the last compartment of the train crosses the same pole with a velocity 'v'. The velocity with which the middle part of the train crosses the pole is

- A: u
- B: v
- C: (u+v)/2
- D: $\sqrt{(u^2 + v^2)/2}$

11. Which of the following is true regarding acceleration a(1), a(2) and a(3) for the graph given below (assume that the object is moving in a straight line),



- A: a(1) > a(2) and a(3) is positive.
- B: a(2) > a(1) & a3 is positive.
- C: a(1) is negative, a(2) is zero and a(3) is positive.
- D: a(1) > a(2) and a(3) is negative.

12. **The potential energy of a 1 kg particle, free to move along the x–axis is given by**

$V_{(x)} = \left(\frac{x^4}{4} - \frac{x^2}{2}\right)$ J.

The total mechanical energy of the potential is 2J. Then, the maximum speed (in m/s) is:

- A: $3/\sqrt{2}$
- C: 2
- B: $1/\sqrt{2}$
- D: $\sqrt{2}$

13. **A fast moving car collides to a wall. $\lim_{\Delta t \to 0} \Delta v/\Delta t$ at the time of impact would be be?**

- A: A low value
- C: Zero
- B: A high negative value
- D: None of the above

14. **In a velocity time graph $\int_{t1}^{t2} v\,dt$ gives?**

- A: Integration
- C: Change in velocity
- B: Displacement
- D: Change in acceleration

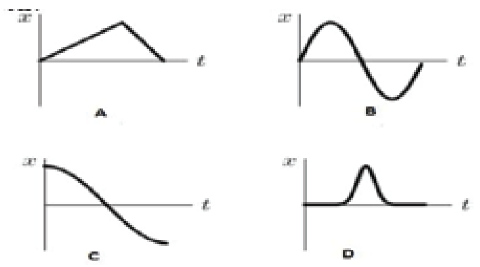
15. **A car starts from rest, moves with an acceleration 'a' and then decelerates at a constant rate 'b' for sometime before coming to rest. If the total time taken is 't' then, the maximum velocity of the car is given by**

- A: abt / (a+b)
- B: a^2t / (a+b)
- C: at / (a+b)
- D: b^2t / (a+b)

16. **A student is standing at a distance of 50 metre from the bus. As soon as the bus begins its motion with an acceleration of 1 ms^{-2}, the student starts running towards the bus with a uniform velocity 'u'. Assuming the motion to be along a straight road, calculate the minimum value of 'u', so that the student is able to catch the bus.**

- A: 8 m/s
- B: 5 m/s
- C: 12 m/s
- D: 10 m/s

17. **A car accelerates from rest on a straight road. Then it deaccelerates to a stop and returns to original position in the same manner by first speeding up and then slowing down to a stop. Which of the following displacement vs time graph depicts the motion of the car?**



- A: A
- B: B
- C: C
- D: D

18. A bullet fired into a fixed target loses half of its velocity after penetrating 3cm. How much further it will penetrate before coming to rest, assuming that it faces constant resistant to motion?

- A: 3 cm
- B: 2 cm
- C: 1.5 cm
- D: 1 cm

19. In a acceleration time graph $\int_{t1}^{t2} a\,dt$ **gives?**

- A: Displacement
- B: Change in acceleration
- C: Change in velocity
- D: Change in time

20. If V_{ins} of a body is decreasing then value of its A_{ins} could be? (V and A are velocity and acceleration)

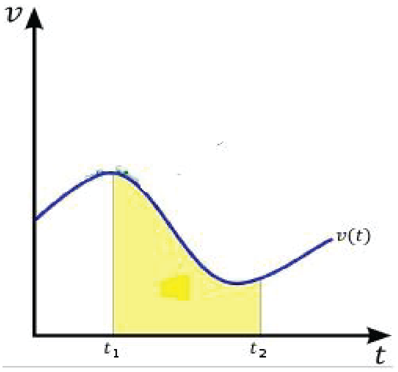
- A: A constant negative value
- B: Increasing negative value
- C: Zero
- D: Both A & B

TEST-4

1. **Which of the following is not correct about the work done in the earth's gravitational field?**
   - A: It is independent of path followed
   - B: It depends on the mass of the body
   - C: It is proportional to the height
   - D: If work is in the direction of gravitational force it is negative.

2. **Total linear momentum of an isolated system remains?**
   - A: Positive
   - B: Negative
   - C: Constant
   - D: Variable

3. **Highlighted area in the graph below shows,**



   - A: Change in velocity
   - B: Change in time
   - C: Acceleration
   - D: Displacement

4. **A very rich boy has an ice hockey practice floor that is essentially frictionless installed in a long refrigerated boxcar in a train. As the train is moving, the boy practices shooting at the goal at the other end of the car. Just as he releases his shot, the train goes around a sharp curve to the left (looking forward in the direction the boy is shooting). Which statement most accurately describes the boy's shot?**
   - A: It curves to the right and misses to the right side of the net.
   - B: It curves to the left and misses to the left side of the net.
   - C: It travels straight and misses to the right side of the net.
   - D: It travels straight and misses to the left side of the net.

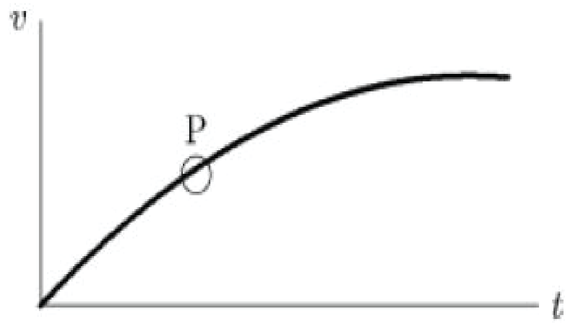
5. **The sun converts 4×10^{10} kg of matter per second into energy. What is the power output of Sun?**
   - A: $3.6 * 10^{13}$ watt
   - B: $3.6 * 10^{27}$ watt
   - C: $3.6 * 10^{14}$ watt
   - D: $3.6 * 10^{35}$ watt

6. **If a body is moving with uniform acceleration?**
   - A: Instantaneous acceleration is zero
   - B: Instantaneous acceleration is equal to the acceleration
   - C: Instantaneous acceleration is constant
   - D: Both B & C.

7. **A ball, which is at rest is dropped from a height 'h' meters. As it bounces off the floor, its speed is 80% of what it was just before touching the ground. The ball will rise to nearly a height of:**

- A: 0.94 h
- B: 0.60 h
- C: 0.80 h
- D: 0.64 h

8. **Below is the velocity time graph of a car. At point P the car must be?**



- A: Moving with zero acceleration
- B: Climbing the hill
- C: Accelerating
- D: Moving at 45 degree with respect to x axis.

9. **When a force is applied on a moving body, its motion is retarded. Then the work done is:**

- A: Positive
- B: Negative
- C: Zero
- D: None of the above.

10. **Area covered under the velocity-time graph is equal to?**

- A: Distance
- B: Acceleration
- C: Momentum
- D: None of the above.

11. **A machine gun fires a bullet of mass 40 g with a velocity 1200 ms^{-1}. The man holding it, can exert a maximum force of 144 N on the gun. How many bullets can he fire per second at the most?**

- A: 1
- B: 2
- C: 3
- D: 4

12. **A force is applied to an object that is free to move. Which of the following statements is correct?**

- A: The frictional force is larger than the applied force.
- B: The frictional force is smaller than the applied force.
- C: The weight of the object is larger than the applied force
- D: All of these statements could be correct.

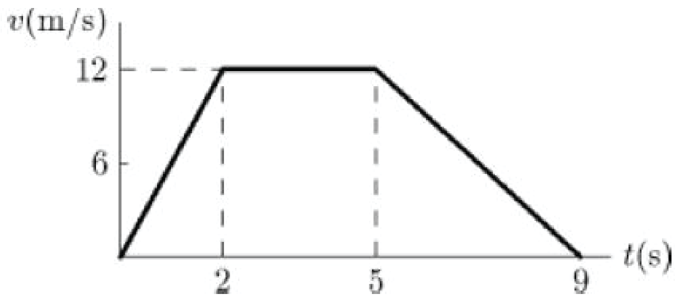
13. **In perfectly elastic collision,**

- A: Elastic bodies collide
- B: Kinetic energy is not conserved
- C: Kinetic energy changes to heat
- D: Kinetic energy is conserved

14. A person travels along a straight road for the first half distance with a velocity v_1 and for the second half distance with a velocity v_2. Then, the mean velocity 'v' is given by

- A: $V = 2v_1v_2 / (v_1 + v_2)$
- B: $V = (v_1 + v_2) / 2$
- C: $1/V = 1/v_1 + 1/v_2$
- D: $V = (v_1v_2)^{-2}$

15. For the V, t graph below for a car, which of the statement is true?

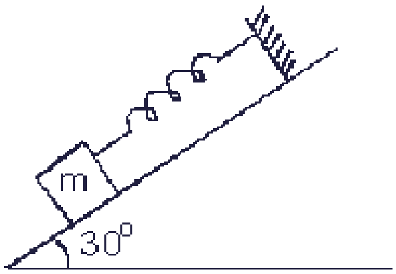


- A: The car accelerate, stop and reverses
- B: The car accelerates at 6 m/s^2 for first 2 sec.
- C: The car deaccelerates at 12 m/s^2 for last 4 sec.
- D: The car returns to its starting point at t=9

16. If $\lim_{\Delta t \to 0} \Delta v / \Delta t$ is an increasing negative value, then velocity of the body is?

- A: Increasing at constant rate
- B: Increasing at increasing rate
- C: Decreasing at constant rate
- D: Decreasing at increasing rate

17. A body of mass 5 kg is suspended by a spring balance on an inclined plane as shown in figure below. The spring balance measures,

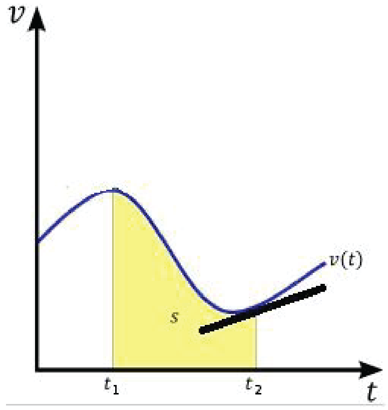


- A: 25 N
- B: 50 N
- C: 43.30 N
- D: 10 N

18. A bike starts from rest and goes down the slope with an acceleration of $5 m/s^2$. What would be the velocity of the bike after 4 s in m/s?

- A: 4
- B: 5
- C: 20
- D: Not enough information.

19. Slope of straight line the graph below shows,



- A: Velocity at time t2
- B: Acceleration at time t2
- C: Displacement at time t2
- D: Orientation at time t2

20. Which, among the following, is a form of energy?

- A: Light
- B: Pressure
- C: Momentum
- D: Force

CIRCULAR MOTION

TEST-1

1. **The largest satellite system is managed by 126 countries and is known as?**

   - A: INTERCOM
   - B: INTERNET
   - C: ISTSAT
   - D: INTELSAT

2. **Einstien's theory states that the gravity follows an inverse square law __________________ .**

   - A: Everywhere
   - B: Everywhere except in weak gravitational fields
   - C: Everywhere except in strong gravitational fields
   - D: At specific locations.

3. **Angular displacement can be expressed using?**

   - A: Degree
   - B: Radian
   - C: Revolution
   - D: All of the above

4. **Suppose a man is standing in an elevator and the elevator is moing upwards with an acceleration "a", then the weight of the man (T) measured by the spring balance is?**

   - A: T = 0
   - B: T = mg
   - C: T = mg + ma
   - D: T = mg - ma

5. **1 degree is equal to:**

   - A: π /180 radians
   - B: 180/π radians radians
   - C: 2π/180 radians
   - D: π/57.3 radians

6. **The whole earth can be covered by at minimum how many geo-stationary satellite/s?**

   - A: 2
   - B: 3
   - C: 5
   - D: 7

7. **When does an artificial earth satellite that is in an elliptical orbit experience its greatest centripetal acceleration?**

   - A: When it first enters orbit
   - B: When it is nearest the earth
   - C: When it is farthest from the earth
   - D: Its centripetal acceleration is always the same

8. In order to create Artificial gravity, the angular acceleration a_c of the spaceship should be?

- A: Should be less than g.
- B: Should be greater than g.
- C: Should be equal to g.
- D: Is varied dependent on the height of the spaceship.

9. The satellites whose orbital motion remains synchronized with earth are called?

- A: Geo-stationary satellites
- B: Geo-synchronous satellites
- C: Orbital satellites
- D: Both A and B

10. A 1000 kg car is moving with a speed of 144 $km.h^{-1}$ in a circular path of radius 100m. What is the required centripetal force?

- A: 4000 N
- B: 8000 N
- C: 16000 N
- D: 32000 N

11. The minimum velocity required to launch an artificial satellite into space is known as?

- **A: Cut off velocity**
- B: Terminal velocity
- C: Release velocity
- D: Critical velocity

12. Which of the following are vector quantities?

- A: Angular Displacement
- B: Angular velocity
- C: Angular acceleration
- D: All of the above

13. Suppose a man is standing in an elevator and the elevator is falling freely under gravity , then the weight of the man measured by the spring balance is?

- A: $T = w + ma$
- B: $T = w = mg$
- C: $T = 2\ mg$
- D: $T = 0$ N

14. If an elevator is moving with a constant speed the apparent weight A and true weight T observe the relation?

- A: $A < T$
- B: $A > T$
- C: $A \neq T$
- D: $A = T$

15. If a car moves with a uniform speed of 2 ms^{-2} in a crcle of radius 0.4. its angular speed is ?

- A: 1.6 rad s^{-1}
- B: 2.8 rad s^{-1}
- C: 4 rad. s^{-1}
- D: 5 rad s^{-1}

16. Suppose a man with weight w is standing in an elevator and the elevator is moving downwards with an acceleration"a", then the weight of the man measured by the spring balance is T = ?

- A: T = 0 N
- B: T = mg
- C: T = w + ma
- D: T = w - ma

17. According to Newton's law of gravity, the force of gravity is given by?

- A: $F = \frac{GmM}{r^2}$
- B: $F = \frac{gmM}{r^2}$
- C: $F = \frac{GmM}{r}$
- D: None of the above

18. The centripetal force is ______________ in magnitude to the centrifugal force and __________________ in direction.

- A: equal, same
- B: equal, opposite
- C: greater, opposite
- D: smaller, same

19. The weight that a spring balance shows when a body is moving towards or away from the center of earth in gravitational field is known as?

- A: True weight
- B: Apparent Weight
- C: Free Fall weight
- D: None of the above

20. Geo-stationary satellite completes one rotation around the earth in?

- A: 3 hours
- B: 6 hours
- C: 12 hours
- D: 24 hours

TEST-2

1. **An object of mass 'm' is suspended in an elevator moving downward with acceleration equal to acceleration due to Gravity . What is the apparent weight of the body?**

   - A: 2mg
   - C: mg / 2
   - B: mg
   - D: Zero

2. **The units of angular momentum are?**

   - A: kg m^2 sec^{-2}
   - C: kg m^2 sec^{-1}
   - B: kg^2 m sec^{-1}
   - D: J sec^{-1}

3. **When a body is whirled in a horizontal circle by means of a string the centripetal force is supplied by?**

   - A: Mass of a body
   - C: Tension in the string
   - B: Velocity of body
   - D: All of the above.

4. **In angular measures, centripetal force can be given by; F_c = ___________**

   - A: $mr\omega$
   - C: $mr^2\omega^2$
   - B: $mr\omega^2$
   - D: mv^2/r

5. **A cyclist cycling around a circular racing track, skids because?**

   - A: Frictional force between the tyre and the ground is zero.
   - B: The limiting friction is more than the centripetal force needed to get round the track at the speed the cyclist is trying to go.
   - C: The limiting friction is not sufficient to supply the centripetal force needed to get round the track at the speed the cyclist is trying to go.
   - D: All of above could be the reasons.

6. **In order to take extra summersaults, the diver should?**

   - A: Should not change his orientation
   - B: Expand his body to full length
   - C: Contract his body to a minimum radius
   - D: Push hard when diving from the board.

7. **Ratio of moment of inertia of two objects 'A' and 'B' is 2:3, which of the following is the ratio of torques of 'A' and 'B' respectively if both are being rotated with constant angular acceleration?**

   - A: 3:4
   - B: 2:3
   - C: 3:2
   - D: 4:3

8. Total number of closely orbiting satellites revolving around the earth to form a GPS is?

- A: 12
- B: 24
- C: 36
- D: 48

9. The direction of linear velocity for an object moving in a circle is ?

- A: Along the axis of rotation
- B: Along the tangent
- C: Directed towards the center
- D: Directed away from the center

10. Torque and angular acceleration are relatd by the equation?

- A: $T = I\alpha$
- B: $T = I\alpha^2$
- C: $T = I^2\alpha$
- D: $T = I^2\alpha / 2$

11. The moment of inertia I for a thin ring is?

- A: mr^3
- B: $mr^2/2$
- C: mr^2
- D: $mr^2/4$

12. When a body moves in a circle, the angle between its linear velocity and angular velocity is always?

- A: 180^0
- B: 0^0
- C: 90^0
- D: 45^0

13. The moment of inertia for solid disk is?

- A: $2mr^2$
- B: mr^2
- C: $mr^2/2$
- D: $mr^2/4$

14. The orbital velocity is given by?

- A: $v = \sqrt{\dfrac{GM}{r^2}}$
- B: $v = \sqrt{\dfrac{GmM}{r}}$
- C: $v = \sqrt{\dfrac{GmM}{r^2}}$
- D: $v = \sqrt{\dfrac{GM}{r}}$

15. The minimum velocity required to launch a satellite in to the space is?

- A: 7900 $m.sec^{-1}$
- B: 5400 $m.sec^{-1}$
- C: 8500 $m.sec^{-1}$
- D: Depends on the weight of the satellite.

16. The rotational K.E of hoop is?

- A: Equal to its translational K.E
- B: Half than its translational K.E
- C: Double than its translational K.E
- D: None of the above.

17. If a car is moving in a circular path of radius 100 m and it subtends a semi circle in 10 seconds. What is the linear speed of the car?

- A: 10 m/sec
- B: 31.4 m/sec
- C: 38.6 m/sec
- D: 22.5 m/sec

18. For creating artificial gravity, the frequency of rotating satellite with radius 90m should be?

- A: 1/2π
- B: 1/4π
- C: 1/5π
- D: 1/6π

19. Frequency of a satellite with radius R, rotating about its own axis is given by?

- A: $f = \frac{1}{2\Pi}(\frac{a_c}{R})^{1/3}$
- B: $f = \frac{1}{2\Pi}(\frac{a_c}{R})^{1/2}$
- C: $f = \frac{1}{2\Pi}(\frac{a_c}{T})^{1/2}$
- D: $f = \frac{1}{2\Pi}(\frac{a_c}{R^2})^{1/3}$

20. For a hoop, the rotational kinetic energy "$K.E._{rot}$" is given by?

- A: mv/2
- B: mv/4
- C: $mv^2/4$
- D: $mv^2/2$

TEST-3

1. **Numair has a weight of 100 N. What is his weight in a roller coster moving downwards with a = 0.3 g?**
   - A: 100 N
   - B: 130 N
   - C: 30 N
   - D: 70 N

2. **The moment of inertia for a sphere is ?**
   - A: mr^2
   - B: $(3/2)\ mr^2$
   - C: $(3/5)\ mr^2$
   - D: $(2/5)\ mr^2$

3. **What is the minimum speed required for an airplane for moving in a vertical loop of radius 1 km if the pilot has to stay intact to his seat at the top of the loop?**
   - A: Mass of the pilot is required to calculate this.
   - B: 980 $m.sec^{-1}$
   - C: 49 $m.sec^{-1}$
   - D: 100 $m.sec^{-1}$

4. **The angular speed of a shaft is 3 $rev.s^{-1}$. If it is stopped and comes to rest in 18 sec, how many revolutions will it have before stopping?**
   - A: 9 revs
   - B: 18 rev
   - C: 27 rev
   - D: 36 rev

5. **According to Einstein's theory, spac ne is curved ________________ the massive bodies.**
   - A: Tangential to
   - B: Perpendicular to
   - C: Away from
   - D: Locally near to

6. **According to Einstein's theory, bodies and light rays move along _____________ ?**
   - A: Straight lines
   - B: Geodesics
   - C: Circular paths
   - D: Spiral paths

7. **A satellite revolves in a circular orbit around earth at a height of 384,000km from the surface of the earth. What is it's of revolution in days?**
   - A: 27.5 days
   - B: 30.8 days
   - C: 42 days
   - D: 35.5 days

8. **Which one of the following is true about Einstein's theory.**

   1. *It includes Newton's theory.*
   2. *It is better than Newton's theory.*
   3. *It does not explain its reason.*
   4. *It gives same answers as Newton's theory.*

- A: 1 only
- C: 1 and 2 only.
- B: 1,2 and 4 only
- D: 2,3 and 4 only.

9. **A hoop and disc have same mass and radius. Their rotational K.E are related by an equation ?**

- A: $K.E_{hoop} = K.E_{disc}$
- C: $K.E_{hoop} = 1/2\ K.E_{disc}$
- B: $K.E_{hoop} = 2\ K.E_{disc}$
- D: $K.E_{hoop} = 4\ K.E_{disc}$

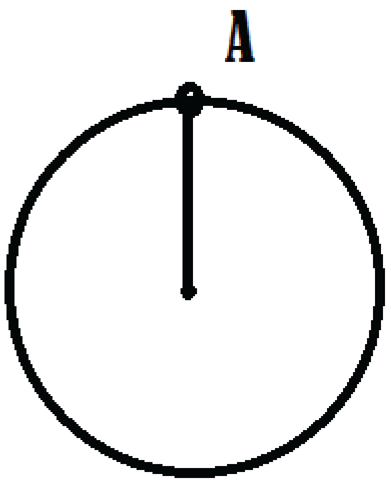
10. **On the ground, the gravitational force on a satellite is W. what is the gravitational force on the satellite when at a height R/50, where R is the radius of the earth?**

- A: 1.04 W
- C: 0.98 W
- B: 1.02 W
- D: 0.96 W

11. **If a body is falling freely in space, the mass of object placed in that body will be?**

- A: Greater than its mass on earth
- B: Lesser than its mass on earth.
- C: zero
- D: Equal to its mass on the earth.

12. **If a ball tied to a string is swung in a circular path under the action of gravity, what will be the tension in the string if the ball is at the top position of the circle?**



- A: Zero
- C: $T = m(v/r + g)$
- B: $T = m(v^2/r + g)$
- D: $T = m(v^2/r - g)$

13. If a body is rolling down a slope WITHOUT sliping, then the total Kinetic energy will have which of the following components:

1. *Translational Kinetic energy*
2. *Rotational kinetic energy*
3. *Energy lost in friction*

A: 1,2 and 3
C: 1 and 2 only
B: 1 and 3
D: 2 only

14. Eintstein predicted the value of bending angle of straight light when it passed near the sun to be ___________ seconds.

A: 1.745
C: 1.1
B: 2.145
D: 3.6

15. A geo-stationary satellite should have a distance r from the centre of Earth, equal to?

A: 23,100 km
B: 31,100 km
C: 42,300 km
D: 51,450 km

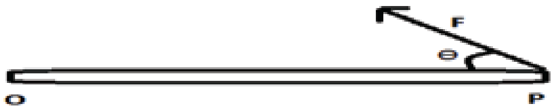
16. If we whirl a stone at the end of a string in the verticle circle, it is likely to break when the stone is?

A: At the highest point
B: At the lowest point
C: At any point during motion
D: At the point where gravity is not acting

17. Distance of the Geo stationary satellites's distance from the center of the earth is given by?

A: $r = \dfrac{GMT^2}{4\Pi^2}$
B: $r = \sqrt{\dfrac{GMT^2}{4\Pi^2}}$
C: $r = \left(\dfrac{GMT^2}{4\Pi^2}\right)^{1/3}$
D: Invalid Equation

18. A force F is acting at a point P of a uniform rod capable to rotate about 'O'. What is the torque about 'O'?



A: OP F (sin Θ)
B: OP F (cos Θ)
C: OP F (tan Θ)
D: OP F

19. According to Newton, gravitation is a/an _________________property of matter.

A: Spatial
B: Extrinsic
C: Normative
D: Intrinsic

20. When a wheel, 1 m in diameter makes 30 rev min, the linear speed of point on its rim in ms^{-1} is ?

A: $\pi/2$
C: 2π
B: π
D: $3\pi/2$

TEST-4

1. **When the satellite is at a considerable height form the center of the earth h>>R, the relation of "g" and height "h" is?**
   - A: g is directly proportional to h^2
   - B: g is inversely proportional to h^2
   - C: g is inversely proportional to h
   - D: g is directly proportional to h

2. **The angular velocity of a rotating beaker with water in it will ________________ if droplets of water are added in it while it is rotating?**
   - A: Increase
   - B: Decrease
   - C: Remains the same
   - D: First increase then decrease

3. **When the body is rotating about its axis of rotatation, the associated angular momentum is known as?**
   - A: Orbital Angular momentum
   - B: Spin angular momentum
   - C: Rotating angular momentum
   - D: Axial angular momentum

4. **Which of the following is required to calculate the orbital speed of a satellite?**

   (i) Mass of the satellite

   (ii) Height of the satellite

   (iii) Geometry of the satellite
   - A: ii only
   - B: i and ii only
   - C: ii and iii only
   - D: i, ii and iii.

5. **If a car is moving in a circular path of radius 100m and it subtends a semi circle in 10 seconds. What is the angular speed of the car?**
   - A: 10π
   - B: $\pi/4$
   - C: $\pi/5$
   - D: $\pi/10$

6. **According to Einstein's theory, space time is ______________ .**
   - A: Linear
   - B: Curved
   - C: Point particle.
   - D: Constant

7. **What is the apparent weight of a pilot with mass 60kg, if his plane accelerating upwards with 4g?**
   - A: 600 N
   - B: 1000 N
   - C: 3000 N
   - D: 5000 N

8. If no force is required to hold an object in a particular frame of reference. It is called?

- A: High force system
- B: Gravity Free system
- C: Gravity pull system
- D: Netural system

9. The body moving along a circular path at constant speed has _______________ velocity.

- A: Constant
- B: Variable
- C: Zero
- D: Increasing

10. The direction of centripetal force can be compared to centripetal acceleration as?

- A: In same direction
- B: In opposite direction
- C: Orthogonal to each other
- D: At 60^0 to each other.

11. If the frequency of a pendulum is four times greater on an unknown planet that it is on earth, then the gravitational constant on that planet is:

- A: 16 times greater
- B: 4 time greater
- C: 16 times lower
- D: 24 times lower

12. Your apparent weight differs from your true weight, at which points during the ride of an elevator?

- A: Start and end
- B: At the middle
- C: Through the whole path
- D: It is always same as true weight.

13. Moment of inertia in rotational motion plays same role as ______________ in linear motion.

- A: Acceleration
- B: Momentum
- C: Mass
- D: Weight

14. Close orbiting satellites generally revolve at what height from the surface of the earth?

- A: 200 km
- B: 300 km
- C: 400 km
- D: 600 km

15. If a hoop is rolling down an inclined plane without slipping, its velocity at the bottom can be given by?

- A: $\sqrt{\frac{1}{2}gh}$
- B: $\sqrt{\frac{1}{4}gh}$
- C: $\sqrt{gh}$
- D: $\sqrt{gh^2}$

16. A disc without slipping rolls down the slope from a height of 10 m. If the disc starts from rest, what is its speed at the bottom?

- A: 10 $m.sec^{-1}$
- B: 11.4 $m.sec^{-1}$
- C: 13.6 $m.sec^{-1}$
- D: 18 $m.sec^{-1}$

17. Dimension of angular acceleration α is?

- A: [deg. T^{-2}]
- B: [T^{-2}]
- C: [rad. T^{-2}]
- D: LT^{-2}

18. A disc and a hoop are both sliding down on an inclined plane from the same height. On reaching the bottom, which one will be moving faster?

- A: Hoop
- B: Disc
- C: Both will come down with same velocity
- D: Insufficient data to analize.

19. In order to create an artificial gravity, the spaceship is?

- A: Revolved in a circular path
- B: Moved tangentially to its original path
- C: Rotated about its own axis
- D: Kept at constant distance from the earth.

20. If a frame of reference is falling freely, the force required to hold an object in that frame is?

- A: Greater than the weight of the body
- B: Less than the weight of the body
- C: Zero
- D: Equal to its weight

FLUID DYNAMICS

TEST-1

1. **Bernoulli's principle is based on the law of conservation of?**

   - A: Mass
   - B: Energy
   - C: Momentum
   - D: None of these.

2. **Equation of continuity states that?**

   - A: Flow per unit time of a fluid in a system remains constant.
   - B: Mass per unit area of a fluid in a system remains constant.
   - C: Density of a fluid in a system remains constant.
   - D: Flow rate continues to increase as the cross sectional area of pipes decrease.

3. **For what kind of flow fluid particles cannot be tracked?**

   - A: Laminar flow
   - B: Streamline flow
   - C: Turbulent Flow
   - D: Both A & B.

4. **As the viscosity of the air increases, the terminal velocity of the falling droplets?**

   - A: Remains same.
   - B: Increases at the same rate.
   - C: Decreases.
   - D: Increases at twice the rate.

5. **Which of the following liquids have smallest viscoity?**

   - A: Honey
   - B: Water
   - C: Tar
   - D: Oil

6. **Which one of the following substances has the greatest viscosity?**

   - A: Water
   - B: Mercury
   - C: Oxygen
   - D: Hydrogen

7. **Equation of continuity is based on the principle of conservation of?**

   - A: Mass
   - B: Energy
   - C: Momentum
   - D: None of the above.

8. **Stoke's law gives?**

- A: Velocity of a body moving in a fluid
- B: Drag force on spherical body moving in a fluid
- C: Defines relationship that AV = constant
- D: Terminal velocity of a spherical object moving in a viscuous fluid.

9. **The equation of continuity is applicable when?**

- A: Flow is steady
- B: Fluid is incompressible.
- C: Fluid mass is conserved.
- D: All of the above.

10. **Viscocity is the measure of?**

- A: Drag force on a moving body.
- B: Force required sliding on layer of liquid over another layer.
- C: Density of liquid.
- D: Thickness of liquid.

11. **An object having spherical shape of radius 'r' experiences retarding force 'F' from a fluid co-efficient of viscosity η when moving through a speed 'v'. What is the ratio of retarding force to speed?**

- A: $6\pi\eta r^2$
- B: $6\pi\eta/r^2$
- C: $6\pi\eta r$
- D: $6\pi\eta/r$

12. **Which of the following uses Bernoulli's principle in its operation?**

- A: Airplane
- B: Formula one car
- C: Sail boat
- D: All of the above.

13. **Bernoulli's Principle is a statement of?**

- A: Hydrostatic equilibrium.
- B: Energy conservation in dynamic fluids.
- C: Mechanical equilibrium in fluids.
- D: All of the above.

14. **Water flows at the rate of 5 m^3/s at the end of a hose with cross sectional area of 10 m^2. What is the speed of water at the end of the hose?**

- A: 50 m/s
- B: 2.8 m/s
- C: 2 m/s
- D: 0.5 m/s

15. **In the fluid flow, for the equation of continuity $A_1V_1 = A_2V_2$, if the velocity of fluid at one end is doubled, what will be cross sectional area at the other end**

- A: Double
- B: Half
- C: $(\text{Double})^2$
- D: $(\text{Half})^2$

16. **Drag force is a function of?**

- A: Surface area of the body.
- B: Density of the fluid.
- C: Velocity of the body.
- D: All of the above.

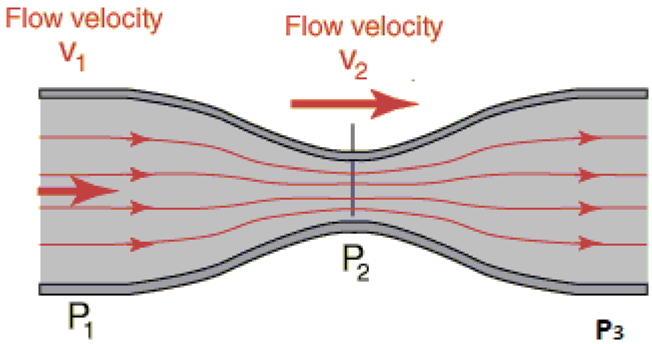
17. **Bernoulli's equation relates pressure of fluid to which other qantities?**

- A: Density & Height
- B: Density * Speed
- C: Speed & Heigth
- D: Area & Speed

18. **An ideal fluid has which of the following properties?**

- A: Obeys Newton's law of viscosity.
- B: Frictionless and incompressible
- C: Very viscuous
- D: Frictionless and compressible.

19. **In the figure below speed of the fluid is highest at point?**



- A: P1
- B: P2
- C: P3
- D: Same at all points.

20. **Water is flowing through a pipe of constant cross-section. At some point the pipe becomes narrow and the cross-section is halved. The speed of water is?**

- A: Reduced to zero.
- B: Increased by a factor of 2.
- C: Decrease by a factor of 2.
- D: Unchanged.

TEST-2

1. If a small-tiny lead shot is gently dropped on the surface of a viscous fluid,

- A: the lead shot will fall with an acceleration equal to g.
- B: the velocity of lead shot will decrease with time.
- C: the velocity of lead shot will increase with time.
- D: the velocity of lead shot will reach a steady value after some time.

2. Which one of the following is the characteristic of a fully developed laminar flow?

- A: The pressure drop in the flow direction is zero.
- B: The velocity profile changes uniformly in the flow direction.
- C: The velocity profile does not change in the flow direction.
- D: None of the above.

3. For an incompressible fluid in a pipe system?

- A: Pressure always remains constant
- B: In horizontal flow highest speed occurs when the pressure is lowest.
- C: In horizontal flow lowest speed occurs when the pressure is lowest.
- D: Bernoulli's equation is not applicable to incompressible liquids.

4. For water flowing through a piping system, the cross sectional area of pipes after point P is halved. The speed of water beyond the point P?

- A: Decreases by 1/2
- B: Increases by 1/2
- C: Remains Same
- D: Increases by 2 times

5. For aeroplane to lift, which of the following conditions must be true?

- A: Air on the top part of the wing must be travelling faster than the lower part of the wing.
- B: Air on the top part of the wing must be travelling slower than the lower part of the wing.
- C: Air on the top part of the wing must be travelling at same speed as on the lower part of the wing.
- D: None of the above.

6. A person holds their hand out of a car window while driving through still air at a speed of V_{car}. What is the maximum pressure on the person's hand?

- A: $P_{max} = 1/2\rho V_{car}^2$
- B: $P_{max} = P + 1/2\rho V_{car}^2$
- C: $P_{max} = P + 1/2\rho V_{car}$
- D: Not enough information given.

7. Within a fluid flowing horizontally?

- A: Lowest speed occurs where the pressure is highest.
- B: Lowest speed occurs where the pressure is lowest.
- C: Pressure remains constant.
- D: Speed is independent of pressure in horizontal flow.

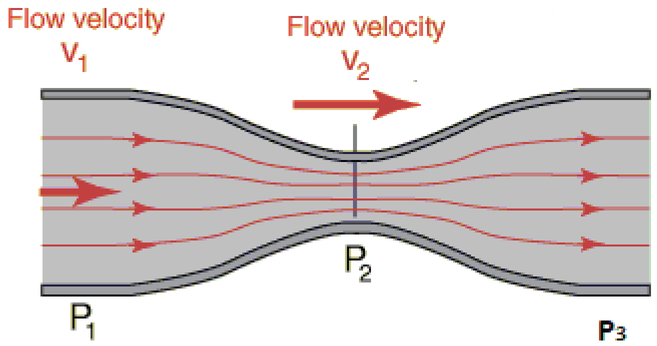
8. **For a liquid flowing in a pipe in horizontal direction, which of the following must remains constant?**

- A: Pressure energy.
- B: Kinetic energy per unit volume.
- C: Potential energy per unit volume.
- D: As per Bernoulli's theorum all of them would change.

9. **Stoke's law is given by:**

- A: $F=6\lambda\eta r^2 v$
- B: $F=6\lambda\eta r v^{-1}$
- C: $F=6\lambda\eta r^2 \rho$
- D: $F=6\lambda\eta r v$

10. **If $V_1 = 0.2$ m/s and $V_2 = 2$ m/s in the figure below. What is the difference between pressure at P1 and P2. Density of water = 1000 kg/m^3.**



- A: 1000 N/m^2
- B: 2000 N/m^2
- C: 2560 N/m^2
- D: 1980 N/m^2

11. **Flow speed of the fluid through a non-uniform pipe increases from 1m/sec to 3 m/sec . If change in potential energy is zero then pressure difference between two points will be? (density of the fluid 1000 kg /m^3)**

- A: 3000 N/m^2
- B: 4000 N/m^2
- C: 1000 N/m^2
- D: 9000 N/m^2

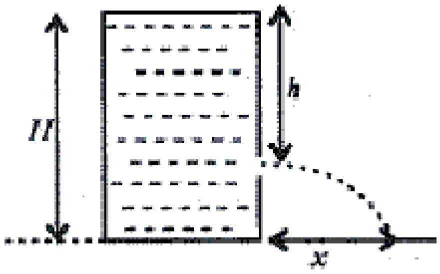
12. **The cylindrical tube of a spray pump has a cross-section of 8 cm^2, one end of which has 40 fine holes, each of area 10^{-8} m^2. If the liquid flows inside the tube with a speed of 0.15 m min^{-1}, the speed with which the liquid is ejected through the holes is?**

- A: 50 m/s
- B: 5 m/s
- C: 0.5 m/s
- D: 0.05 m/s

13. **Study of fluids in motion is made simpler by using which conservation principle / principles?**

- A: Conservation of Mass
- B: Conservation of Energy
- C: Both A & B
- D: None of the above

14. Which of the following phenomena is resulting in the efflux of fluid in the figure below?



- A: Kinetic energy at height H is being transferred to Kinetic energy at depth h.
- B: Potential energy at height H is being transferred to Kinetic energy at depth h.
- C: Potential energy at height H is being transferred to Potential energy at depth h.
- D: Pressure at height H is higher that pushes the water out at depth h.

15. As the drop of water falls down the drag force on it?

- A: Increases
- B: Decreases
- C: Remains constant
- D: Depends on the the size of the droplet.

16. Viscosity is the property of liquids by virtue of which?

- A: Liquid opposes relative motion of its parts.
- B: Liquid pushes neighbouring moleclues.
- C: Liquid attracts other molecules.
- D: None of these.

17. If each particle in a fluid motion passes through the same point as followed by earlier particle. The flow is said to be?

- A: Streamline
- B: Laminar
- C: Turbulent
- D: Both A & B

18. A manometer connected to a closed tap reads 4.5×10^5 Pa. When the tap is opened, the reading of the manometer falls to 4×10^5 Pa. What is the velocity of flow of water?

- A: 7 m/s
- B: 8 m/s
- C: 9 m/s
- D: 10 m/s

19. Drag force on an spherical object increases with?

- A: Increase in velocity
- B: Increase in viscosity of medium
- C: Increase in surface area of the object.
- D: All of the above.

20. Water at a gauge pressure of 3.8 atm at street level flows in to an office building at a speed of 0.06 m/s through a pipe 5.0 cm in diameter. The pipes taper down to 2.6 cm in diameter by the top floor, 20 m above. Calculate the flow velocity in such a pipe on the top floor.

- A: 2.2 m/s
- B: 5.8 m/s
- C: 0.11 m/s
- D: None of the above.

TEST-3

1. **For the horizontal pipe, the fluid inside it is flowing horizontally then Bernouli's equationcan be written as:**

   - A: $P + \rho v^2$ =constant
   - B: $P + v^2$ =constant
   - C: $2P + \rho v^2$ =constant
   - D: $2P + 2\rho v^2$ =constant

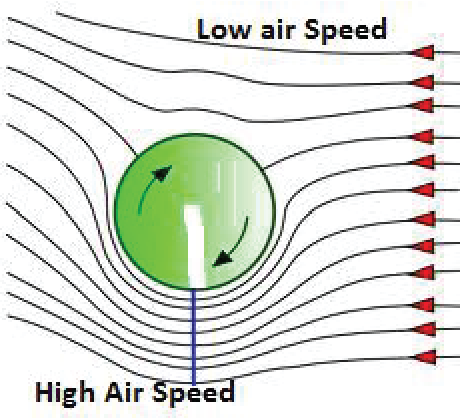
2. **A small spherical ball falling through a viscous medium of negligible density has terminal velocity 'v' Another ball of the same mass but of radius twice that of the first one falling through the same viscous medium will have terminal velocity?**

   - A: 2v
   - B: v/4
   - C: v/2
   - D: $(v/2)^{1/2}$

3. **As water from tap falls the cross sectional area of water flows?**

   - A: Remains same
   - B: Increases
   - C: Decreases
   - D: None of the above

4. **In the figure below, In which direction would you expect the ball to swing? Use the information given in the figure**



   - A: Upwards
   - B: Downwards
   - C: No swing
   - D: Need information about pressure to answer the question.

5. **Bernoulli's theorem implies that?**

   - A: In a steady flow, the sum of all forms of mechanical energy in a fluid along a streamline is the same at all points on that streamline.
   - B: The sum of kinetic energy and potential energy remain constant.
   - C: An increase in the speed of the fluid occurs proportionately with an increase in both its kinetic energy, and a decrease in its static pressure and potential energy.
   - D: All of the above.

6. **Water circulates throughout a house in a hot-water heating system. If water is pumped out at a speed of 0.50 m/s through a 4.0 cm diameter pipe in the basement under a pressure of 3.0 atm, what will be the flow speed and pressure in a 2.6 cm diameter pipe on the second floor 5.0 m above? Assume pipes do not divide into branches and 1 atm = 100 KPa**

- A: 0.5×10^5 N/m^2
- B: 1.5×10^5 N/m^2
- C: 2.5×10^5 N/m^2
- D: 3.5×10^5 N/m^2

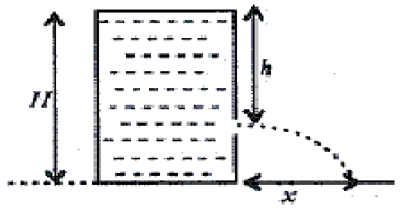
7. **Major loss of energy in long pipes is due to?**

- A: Sudden enlargement.
- B: Sudden contraction.
- C: Both A & B
- D: Friction.

8. **What is the lift (in newtons) due to Bernoulli's principle on a wing of area 100 m^2 if the air passes over the top and bottom surfaces at speeds of 340 m/s and 290 m/s, respectively? Assume density is 1.3 kg/m^3.**

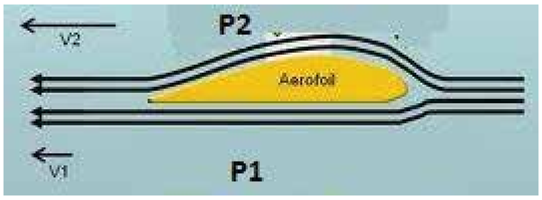
- A: 2.0×10^3 N
- B: 2.0×10^4 N
- C: 2.0×10^5 N
- D: 2.0×10^6 N

9. **The water filled in a tank has a hole 'h' meters from the top. Find the distance 'x' where the stream of water will touch the ground from the bottom.**



- A: $\sqrt{2gh}$
- B: $\sqrt{2g(H-h)}$
- C: $2g(H-h)$
- D: $2\sqrt{h(H-h))}$

10. **With reference to the figure of an airplane wing as shown below, if $V_2 > V_1$, which of the following is true?**



- A: $P_2 > P_1$ and the plane is taking off.
- B: $P_2 > P_1$ and the plane is landing.
- C: $P_1 > P_2$ and the plane is taking off.
- D: $P_1 > P_2$ and the plane is landing.

11. For a sphere moving in a viscuous medium, if the speed is increased by 10 times the drag force?

- A: Increases by 10 times
- B: Incrases by 5 times
- C: Remains same
- D: Cannot answer with given information.

12. Plant Zoro has half the force of gravity than that of earth. What is the terminal velocity of a falling spherical body on Zoro as compared to earth? Assume all other factors in planet Zoro are same as that of the Earth.

- A: Same as that on the earth.
- B: Higher than that on the earth.
- C: Lower than that on the earth.
- D: Not enough information to answer the question.

13. An incompressible fluid flows steadily through a cylindrical pipe, which has radius '2r' at point 'A' and radius 'r' at 'B' along the direction of the flow. If the velocity at point 'A' is 'v', its velocity at point 'B' is?

- A: 2V
- B: V
- C: V/2
- D: 4V

14. If speed of efflux through a small hole in a large tank is 9.8 m/s . Find the height of fluid above the hole?

- A: 9.8m
- B: 4.9m
- C: 19.6m
- D: 1m

15. Which of the following shows the condition of terminal velocity?

- A: $\int_{t1}^{t2} a\,dt = constant$
- B: $\int_{t1}^{t2} a\,dt = positive$
- C: $\int_{t1}^{t2} a\,dt = negative$
- D: $\int_{t1}^{t2} a\,dt = zero$

16. A metallic ball of radius 'r' falls in a tank of liquid at the instant when its acceleration is one-half that of a freely falling body. (The densities of metal and of liquid are ρ and σ respectively, and the viscosity of the liquid is η) What is the velocity 'v' of the metallic ball?

- A: $\frac{r^2 g}{9\eta}(\rho - 2\sigma)$
- B: $\frac{r^2 g}{9\eta}(2\rho - \sigma)$
- C: $\frac{r^2 g}{9\eta}(\rho - \sigma)$
- D: $\frac{2r^2 g}{9\eta}(\rho - \sigma)$

17. Water hose with internal radius of 0.01 m has water flowing at the rate of 10 kg per 20 s. What is the water speed at the outlet? Density of water is 1000 kg/m^{3}.

- A: 1.6 m/s
- B: 2.8 m/s
- C: 3.2 m/s
- D: 3.8 m/s

18. A hose with cross sectional area "A" has a fluid flowing at the rate of "M" kg/s. What is the speed of the fluid at the the outlet of the hose if its density is D?

- A: V = D / (M * A)
- B: V = M / (D * A)
- C: V = (D * A) / M
- D: V = M * D / (A)

19. $\lim_{\Delta t \to 0} \Delta v / \Delta t$ **for terminal velocity is?**

- A: Zero
- B: Positive
- C: Negative
- D: Constant

TEST-4

1. **When cooking oil is heated it becomes more fluid because?**

   - A: Viscosity decreases with increase in temperature.
   - B: Viscosity increases with increase in temperature.
   - C: As per Bernoulli's principle, the increase in temperature results in the liquids becoming more fluid.
   - D: Effect of heat radiation results in fluidity.

2. **Mass flow per second of fluid is given by**

   - A: $\rho A v$
   - B: Av/ρ
   - C: Av
   - D: ρv

3. **Exact path of a particle in a moving fluid cannot be predicted in?**

   - A: Streamline flow
   - B: Laminar Flow
   - C: Turbulent Flow
   - D: All of the above.

4. **Dimensions of dynamic viscosity are?**

   - A: $L^{2}T^{-1}$
   - B: $L^{-1}T^{-1}$
   - C: $ML^{-1}T^{-1}$
   - D: $ML^{-1}T^{-2}$

5. **Which of the following characteristics at a point do not change over time for a steady flow?**

   - A: Density
   - B: Velocity
   - C: Pressure
   - D: All of the above.

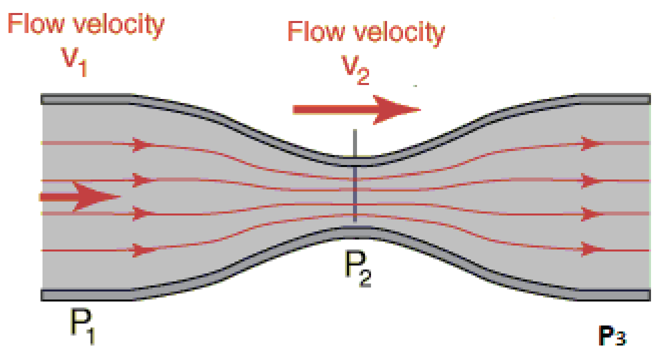
6. **Units of dynamic viscosity are?**

   - A: Kg m / s
   - B: Kg / (ms)
   - C: Kg m / s^2
   - D: Kg s / m

7. **As temperature increases the viscosity of fluids?**

   - A: Increases
   - B: Decreses
   - C: Remains same.
   - D: It may increase or decrease dependent on the nature of the fluid.

8. **Which of the following is true regarding the pressure at points P_1, P_2 & P_3 for the figure below?**



- A: $P_1 = P_2 = P_3$
- C: $P_1 = P_3 < P_2$
- B: $P_1 = P_3 > P_2$
- D: $P_1 \neq P_2 \neq P_3$

9. **Equation of continuity is not applicable to?**

- A: Laminar flow
- C: Turbulent flow
- B: Viscuous liquids
- D: Both B & C.

10. **When a body is moving with terminal velocity the acceleration becomes?**

- A: Positive.
- C: Negative
- B: Zero
- D: Variable.

11. **Energy losses are highest in which kind of flow?**

- A: Laminar flow
- C: Turbulent flow
- B: Transition flow
- D: Critical flow

12. **Sphygmamanometer is an instrument used to measure?**

- A: Pressure in water pipes.
- B: Air pressure.
- C: Blood pressure.
- D: Steam pressure.

13. **As the drag force on a falling droplet of water equals the weight of the drop, its velocity?**

- A: Increases
- B: Decreases
- C: Remains constant
- D: Depends on the size of the drop.

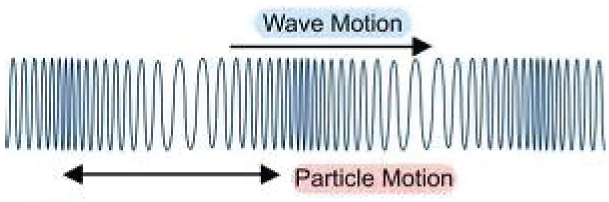
14. **A hydraulic automobile lift is designed to lift cars with a maximum mass of 3000 kg. The area of cross-section of the piston carrying the load is 425 cm^2. What maximum pressure would the smaller piston have to bear? (Given, g = 9.8 ms^{-2}).**

- A: $6.92 \times 10^5\ Nm^{-2}$
- C: $6.92 \times 10^6\ Nm^{-2}$
- B: $3.46 \times 10^5\ Nm^{-2}$
- D: $69.2\ Nm^{-2}$

WAVES & OSCILATIONS

TEST-1

1. **The figure below showed which kind of wave?**



- A: Traverse wave
- B: Longitudinal wave
- C: Pulse
- D: None of the above.

2. **Number of beats produced per second by two tuning forks of frequency 324Hz and 320Hz is?**

- A: 2
- B: 4
- C: 8
- D: 16

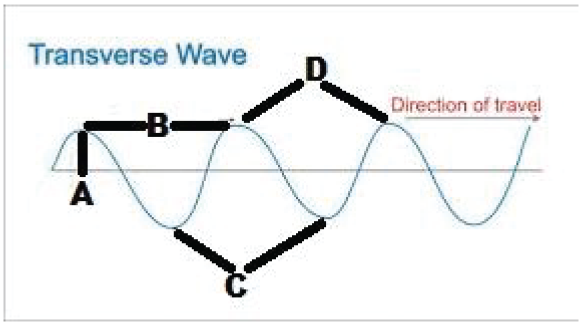
3. **Which of the following is the mathematical representation of the acceleration of the simple harmonic motion?**

- A: a α -x
- B: a α x
- C: a α -1/x
- D: a α 1/x

4. **The distance between any two consecutive crests of throughs in the periodic waves is equal to?**

- A: λ
- B: λ/2
- C: λ/3
- D: λ/4

5. **In the figure below A, B, C and D represent?**



- A: Crest, Trough, Amplitude and Wavelength respectively.
- B: Wavelength, Amplitude, Through and Crest respectively.
- C: Amplitude, Wavelength, Crest and Trough respectively.
- D: Amplitude, Wavelength, Trough and Crest respectively.

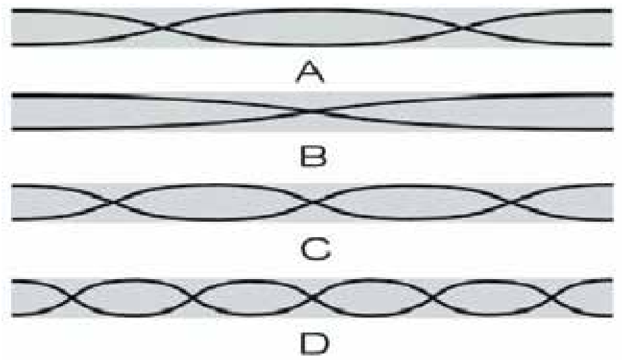
6. Which of the following statement defines the Simple Harmonic Motion (SHM)?

- A: A motion with constant retarding force
- B: A motion where energy is not conserved.
- C: Oscillatory motion without a restoring force.
- D: Oscillatory motion under a restoring force.

7. Which of the following is the correct expression for the Simple Harmonic Motion of a mass attached to a spring?

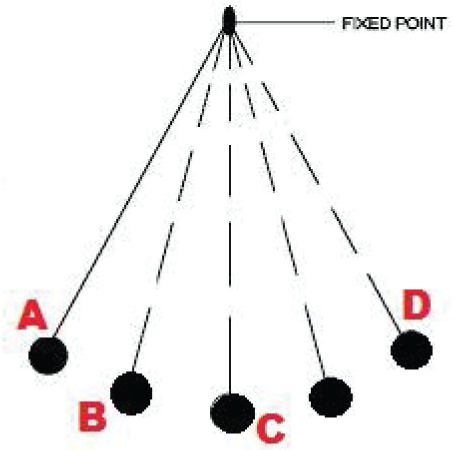
- A: $v = v_o\sqrt{1 - \frac{x^2}{x_o^2}}$
- C: $v = v_o\sqrt{1 - x^2}$
- B: $v = v_o\sqrt{1 + \frac{x^2}{x_o^2}}$
- D: $v = v_o\sqrt{1 - \frac{x^2}{2x_o^2}}$

8. Which of the diagrams shows the pipe containing waves with the longest wavelength?



- A: A
- C: C
- B: B
- D: D

9. Kinetic energy of the pendulum bob is highest at which point?



- A: A
- C: C
- B: B
- D: A and D

10. Mathematical formula of maximum velocity for a body executing simple harmonic motion is :

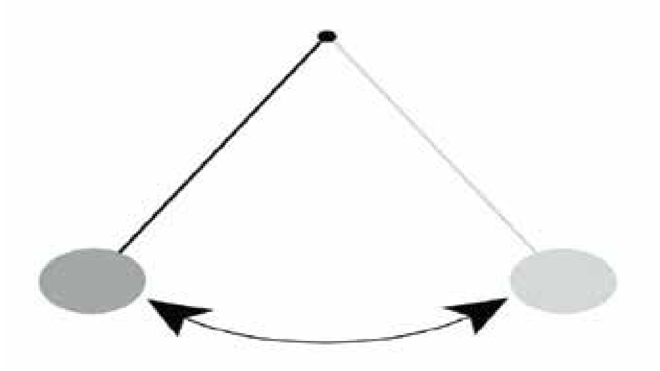
- A: $v = \omega\sqrt{x_o^2} - x^2$
- C: $v = \sqrt{x_o^2} - x^2$
- B: $v = \omega\sqrt{x_o^2}$
- D: $v = \omega\sqrt{x_o^2 - x^2}$

11. An observer moves with a velocity v towards a stationary source, the number of waves received in one second will be :

- A: $f' = f\left(\frac{v + u_s}{u_s}\right)$
- C: $f' = (u/(v + u_s))f$
- B: $f' = f\,(v + u_s)/v$
- D: $f' = (v/(v + u_s))\,f^2$

12. Which of the following is the Laplace's expression for the speed of sound in the gasses?

- A: $v = \sqrt{\frac{E}{\rho}}$
- C: $v = \sqrt{\frac{\gamma P}{\rho}}$
- B: $v = \sqrt{\frac{P}{\rho}}$
- D: $v = \sqrt{\frac{\gamma E}{\rho}}$



13. A pendulum is used on Earth and then transported to the moon where it is released and allowed to swing freely. Which of the following statements about the pendulum is correct?

- A: The period of the pendulum on the moon is greater than it was on Earth.
- B: The frequency of the pendulum on the moon is greater than it was on Earth.
- C: The potential energy of the pendulum on the moon is greater than it was on Earth.
- D: The kinetic energy of the pendulum on the moon is greater than it was on Earth.

14. Which of the following statement is correct?

- A: Waves transport energy and matter.
- B: Waves transport energy without transporting matter.
- C: Waves transport matter without transporting energy.
- D: Waves transport neither matter nor energy.

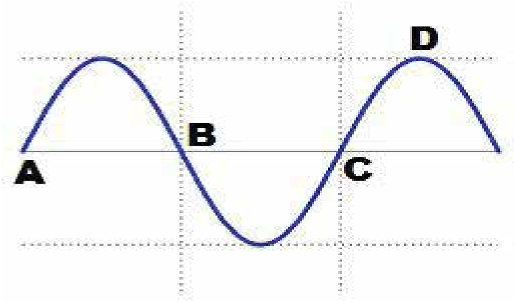
15. The direction of reflected wave remains the same when?

- A: A traverse wave travelling in a rare medium is reflected back by a denser medium.
- B: A traverse wave travelling in a dense medium is reflected back by a rarer medium.
- C: A traverse wave travelling in a dense medium is reflected back by a denser medium.
- D: A traverse wave travelling in a dense medium is reflected back by a similar medium.

16. Due to some mechincal fault a lift falls freely from the top of a multistory building. Which of the followings is the apparent weight of a man inside the lift if mass of man is 80kg while value of g is $10 m/s^2$?

- A: 900 N
- B: 800 N
- C: Zero
- D: 700 N

17. Which of the following choices show the interval of a one full vibration in the given figure?



- A: AB
- B: AC
- C: AD
- D: BD

18. Harmonic series in the stationary waves is determined by?

- A: Length of the string.
- B: Tension of the string.
- C: Mass per unit length.
- D: All of the above.

19. A body oscillates due to which kind of force?

- A: Frictional force
- B: Rotationary force
- C: Periodic force
- D: Restoring force

20. If E is the elastic modulus and *p* is the density. The speed of sound is given by?

- A: $v = E/p$
- B: $v = p/E$
- C: $v = (E/p)^{1/2}$
- D: $v = (p/E)^{1/2}$

TEST-2

1. **When source of sound moves towards the stationary observer , the value of apperent frequency ;f_s' is:**

- A:
- B: $f_2 = \left(\frac{v+b}{v}\right)f$
- C: $\therefore f^{l} = f\left(1+\frac{v}{c}\right)$
- D: $f' = \frac{f}{(1+\frac{v_s}{v})}$

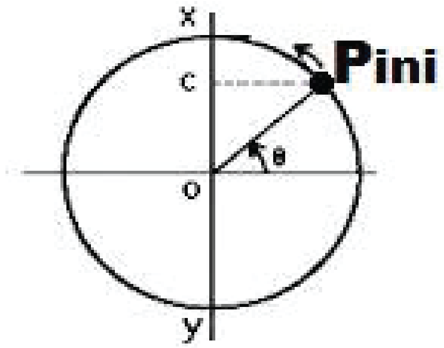
2. **When two tuning forks (fork 1 and fork 2) are sounded simultaneously, 4 beats per second are heard. Now, some tape is attached on the prong of the fork 2. When the tuning forks are sounded again, 6 beats per second are heard. If the frequency of fork 1 is 200 Hz, then what was the original frequency of fork 2?**

- A: 200 Hz
- B: 204 Hz
- C: 196 Hz
- D: 194 Hz

3. **Newton's formula for the speed of sound in air is?**

- A: $v = \sqrt{\frac{E}{\rho}}$
- B: $v = \sqrt{\frac{P}{\rho}}$
- C: $v = \sqrt{\frac{\gamma P}{\rho}}$
- D: $v = \sqrt{\frac{\gamma E}{\rho}}$

4. **If P_{ini} is the initial position of the object moving in a circle with angular velociy ω. Which of the following is the correct representation of the instantaneous position of the Simple Harmonic Motion of the projection OC?**

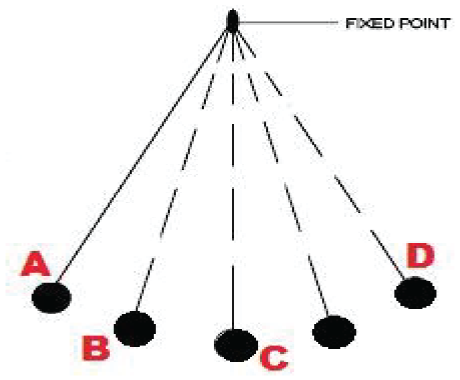


- A: OC = sin (ωt)
- B: OC = sin (ωt + Θ)
- C: OC = cos (ωt)
- D: OC = cos (ωt + Θ)

5. **Two waves have destructive interference when path difference Δs =?**

- A: $n\lambda/2$ where n = set of integers.
- B: $n\lambda$ where n = set of integers.
- C: $(2n+1)\lambda/2$ where n = set of integers.
- D: $(2n+1)\lambda/3$ where n = set of integers.

6. **PE of the pendulum bob is highest at which position?**



- A: A
- B: B
- C: C
- D: Both A and D

7. **A simple harmonic oscillator has a time period of 10 seconds. Which equation relates its acceleration 'a' and displacement 'x'?**

- A: $a = -10x$
- B: $a = -(20\pi)x$
- C: $a = -(20\pi)^2x$
- D: $a = -(2\pi/10)^2x$

8. **If a transverse wave is moving in the positive *x*-direction, its oscillations may occur in up and down directions in which plane?**

- A: x plane or -x plane.
- B: y plane only.
- C: z plane only.
- D: y plane or z plane.

9. **If a transverse wave is moving in the positive *x*-direction, its oscillations may occur in up and down directions in which plane?**

- A: x plane or -x plane.
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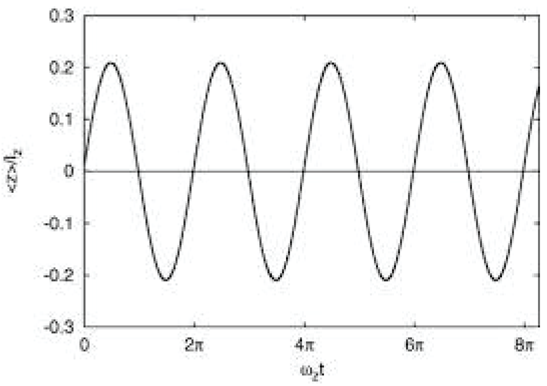
- C: z plane only.
- D: y plane or z plane.

10. **For the frictionless motion of a pendulum which of the following remains constant?**

- A: Velocity
- B: Acceleration
- C: Potential energy
- D: Total energy.

11. Variation of amplitude with respect to time for an oscillating object is shown in figure:



Identify the oscillation:

- A: Damped
- B: Critical
- C: Heavily damped
- D: Undamped

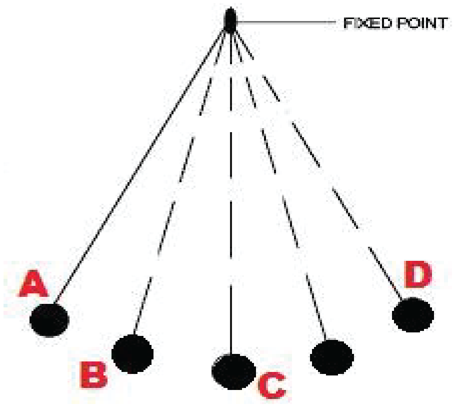
12. If the speed of sound in the air at 0^o C is 332 m/s. Then what is the speed at 5^o C?

- A: 330 m/s
- B: 332 m/s
- C: 334 m/s
- D: 335 m/s

13. A submarine sends out a sonar signal (sound wave in a direction directly downward. It takes 2.3 s for the sound wave to travel from the submarine to the ocean bottom and back to the submarine. How high (approx) up from the ocean floor is the submarine? (the speed of sound in water is 1,490 m/s)

- A: 3400m
- B: 1700m
- C: 50000m
- D: 9000m

14. For the figure given below, the velocity of the pendulum bob is the maximum at which point?



- A: A
- B: B
- C: C
- D: Both A and D

15. **A simple pendulum consists of a bob, which is a hollow sphere containing mercury suspended by means of a wire. If the mercury is drained out from a small hole at the bottom, the period of the pendulum will? (assume that mercury is drained suddently in no time)**

- A: Increase gradually and then attain a constant value.
- B: Increase
- C: Decrease
- D: Remain same

16. **What is the distance between a node and the next anti-node in the stationary waves?**

- A: λ
- B: $\lambda/2$
- C: $\lambda/3$
- D: $\lambda/4$

17. **What is the the period of mass spring system during SHM if the ratio of mass to spring constant is 1/4?**

- A: pi
- B: 2pi
- C: 1/pi
- D: 1/2pi

18. **Frequency of simple pendulum of length 9.8m will be?**

- A: 2π Hertz
- B: $\pi/2$ Hertz
- C: $1/2\pi$ Hertz
- D: $\pi/4$ Hertz

19. **At what temperature the velocity of sound in air is three times the velocity at 10^oC?**

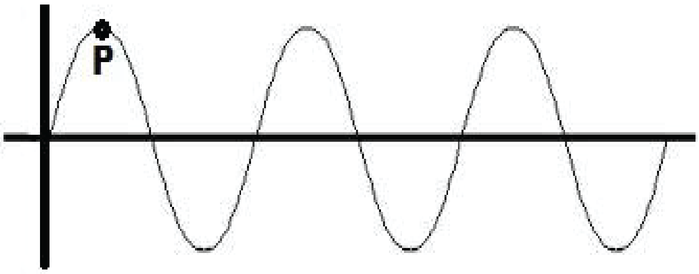
- A: 2274^oC
- B: 849^oC
- C: 576^oC
- D: 2547^oC

20. **Which of the following quantities would not affect the speed of the sound in the gases?**

- A: Pressure
- B: Temperature
- C: Density
- D: They all affect the speed of sound in the gas.

TEST-3

1. For the give graph of sinosidal wave, any point at a distance x on positive x-axis would lead the point P by phase angle?



- A: $\pi x/\lambda$
- B: $\pi x/2\lambda$
- C: $2\pi x/\lambda$
- D: $4\pi x/\lambda$

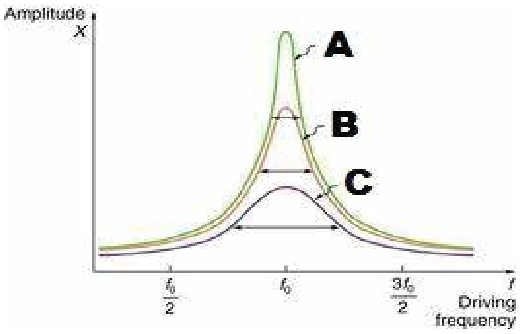
2. An open pipe is suddenly closed at one end with the result that the frequency of third harmonic of the closed pipe is 100 Hz higher than the fundamental frequency of the open pipe. The fundamental frequency of the open pipe is?

- A: 100 Hz
- B: 200 Hz
- C: 300 Hz
- D: 400 Hz

3. An oscillating pendulum is allowed to fall freely under gravity along with its support. The time period of the oscillation will?

- A: Increase
- B: Decrease
- C: Remain same
- D: Become infinite

4. Which of the following resonating frequency curve has the highest damping?



- A: A
- B: B
- C: C
- D: We do not have enough information to answer the question.

5. In the forced oscillation of a particle, the amplitude is maximum for a frequency ω_1 of the force while the energy is maximum for a frequency ω_2 of the force. Then?

- A: $\omega_1 = \omega_2$
- B: $\omega_1 > \omega_2$
- C: $\omega_1 < \omega_2$
- D: None of the above.

6. For vibrating mass-spring system, the expression of kinetic energy at any displacement 'x' is given by:

- A: $1/2m\omega(x_o^2-x^2)$
- B: $1/2kx_o^2$
- C: $1/2\ kx_o^2[1-x^2/x_o^2]$
- D: $1/2m\omega^2x_o$

7. A boat at anchor is rocked by waves whose crests are 100 m apart and the velocity is 25 m/s. The boat bounces up once every_________.

- A: 2500 s
- B: 75 s
- C: 4 s
- D: 0.25 s

8. Two masses m_1 and m_2 are suspended together by a mass-less spring of spring constant K. When the masses are in equilibrium, m_1 is removed without disturbing the system. The amplitude of the oscillation of m_2 is?

- A: m_1g/k
- B: m_2g/k
- C: m_1k/g
- D: m_2k/g

9. If the tension of the string is increased by four times the fundamental frequency of harmonic series of stationary waves would?

- A: Increase by four times.
- B: Decrease by four times.
- C: Increase by two times.
- D: Decrease by two times.

10. The particle harmonic motion has a kinetic energy $K_0\sin^2\omega t$. The maximum values of the potential energy, and the total energy are respectively?

- A: $K_o/2$ and K_o
- B: $K_o/2\cos\omega t$ and $K_o\ \omega t$
- C: $K_o/2$ and $2K_o$
- D: K_o and K_o

11. If the tension in the string and the length of the string are both increased by four times, the fundamental harmonic frequency of the stationary wave would?

- A: Remain same.
- B: Decrease by half.
- C: Increase by two times.
- D: Decrease by 1/4.

12. The instantaneous displacement of a simple harmonic oscillator is given by $y = A\ \text{cost}\ (\omega t + \pi/4)$. Its speed will be Minimum at the time?

- A: $2\pi/\omega$
- B: $\omega/2\pi$
- C: ω/π
- D: $-\pi/4\omega$

13. Two pendulums of same length oscillate with the same amplitude but with a constant phase difference of 90°. If the maximum velocity of one is v, the maximum velocity of the other will be?

- A: 2v
- B: v/2
- C: v
- D: $\sqrt{v}$

14. A particle of mass 0.1 kg is held between two springs of spring constant 8N/m and 2N/m. If this particle is displaced along the length of spring, what will be the time period of vibration of spring?

- A: $\pi/2$ s
- C: $2\pi/3$ s
- B: $\pi/3$ s
- D: $\pi/5$ s

15. What should be the ratio of K.E to the total energy in Simple harmonic motion :

- A: $\left(1 - x^2/x_o^2\right)$
- C: $\left(x^2/x_o^2\right)$
- B: 1
- D: $1/2x$

16. Two identical organ pipes are producing fundamental notes of frequencies 200 hz at 15°C. If the temperature of one pipe is raised to 27°C, the number of beats produced will be?

- A: 2
- C: 6
- B: 4
- D: 8

17. A lift is ascending with acceleration g/3. What will be the time period of a simple pendulum suspended from its ceiling, if its time period in stationary lift is T?

- A: $\sqrt{3}T/2$
- B: $\sqrt{3}T/4$
- C: T/2
- D: T/3

18. A particle executes simple harmonic motion between x = - A and x = + A. The time taken for it to go from 0 to A/2 is T_1, and to go from A/2 to A is T_2. Then, ?

- A: $T_1 < T_2$
- B: $T_1 > T_2$
- C: $T_1 = T_2$
- D: $T_1 = 2T_2$

19. Two particles A and B of equal masses are suspended from two massless springs of spring constants k_1 and k_2 respectively. If the maximum velocities during oscillations are equal, the ratio of amplitudes of A and B is?

- A: $(k_1/k_2)^{1/2}$
- B: k_1/k_2
- C: $(k_2/k_1)^{1/2}$
- D: k_2/k_1

20. A spring balance has a scale that reads 50 kg and the length of the spring at that point is 20 cm. A body suspended from the spring, when displaced and released, oscillates with a period of 0.6 s. The weight of the body is?

- A: 219 N
- B: 185 N
- C: 132 N
- D: 98 N

TEST-4

1. What is the beat frequency produced when the following two waves are sounded together?
$x_1 = 10 \sin(404\pi t - 5\pi x)$, $x_2 = 10 \sin(400\pi t - 5\pi x)$.

- A: 2
- B: 4
- C: 6
- D: 8

2. Time period of a mass attached to a spring and undergoing simple harmonic motion is given by?

- A: $t = \pi\sqrt{\frac{m}{k}}$
- B: $t = 2\pi\sqrt{\frac{k}{m}}$
- C: $t = 2\pi\sqrt{\frac{m}{k}}$
- D: $t = m\sqrt{\frac{2\pi}{k}}$

3. Two similar waves of equal frequency travelling in opposite direction produce?

- A: Interference
- B: Beats
- C: Stationary waves
- D: Homologous waves

4. In a Simple Harmonic Motion with a radius' x_o', the velocity of the particle at any point is:

- A: $v=\omega(x_o^2-x^2)^{1/2}$
- B: $v=\omega(x_o^2-x^2)$
- C: $v=\omega(x_o-x)^{1/2}$
- D: $v=\omega(x-x_o)^{1/2}$

5. Speed of sound waves depend on which of the following?

- A: Compressibility of the medium.
- B: Inertia of the medium.
- C: Both compressibility and inertia of the medium.
- D: Sound waves speed is constant and independent of the compressibility or inertia of the medium.

6. One degree Celsius rise in temperature produces approximately how much increase in the speed of the sound?

- A: 0.28 m/s
- B: 0.36 m/s
- C: 0.49 m/s
- D: 0.61 m/s

7. If a medium is more compressible than the medium x, then the speed of sound in that medium as compared to x would be?

- A: Lower
- B: Higher
- C: Same
- D: Could be higher or lower.

8. What is the minimum length of a tube open at both ends that resonates with tuning fork of frequency 350 Hz? (Velocity of sound in air = 350 m/s).

- A: 25 cm
- B: 50 cm
- C: 75 cm
- D: 100 cm

9. The equation of a simple harmonic wave is given by $y = 5 \sin \pi/2 (100t - x)$, where x and y are in metre and time is in seconds. The period of the wave in seconds will be?

- A: 0.5 s
- B: 0.15 s
- C: 0.04 s
- D: 0.01 s

10. In stationary waves, when antinodes are at their extreme position the energy stored in them is?

- A: Stationary waves do not store energy.
- B: Kinetic Energy.
- C: Potential Energy.
- D: A mix of kinetic and potential energy.

11. The frequency of a tuning fork is 256 Hz. The velocity of sound in air is 344 ms^{-1}. The distance travelled (in metres) by the sound during the time in which the tuning fork completes 32 vibrations is?

- A: 19
- B: 43
- C: 88
- D: 129

12. Speed of sound through a gas is measured as 340m/s at pressure P_1 and temperature T_1. What will be the speed of sound if pressure of gas is doubled but the temperature is kept constant?

- A: 342m/s
- B: 340m/s
- C: 170m/s
- D: 680m/s

13. Time period of a pendulum depends on which of the following?

Length of the pendulum

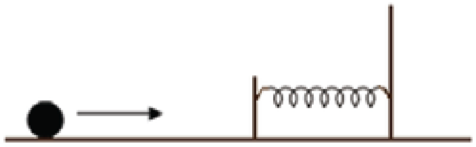
Acceleration due to gravity

Mass of the pendulum

- A: i only
- B: i and ii
- C: i and iii
- D: i, ii and iii.

14.

A mass of 0.5 kg moving with a speed of 1.5 m/s on a horizontal smooth surface collides with a nearly weightless spring of force constant k = 50 N/m. The maximum compression of the spring would be

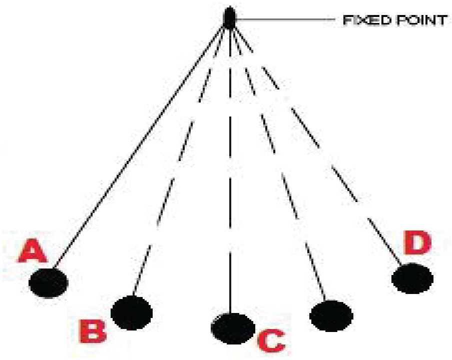


- A: 0.15 m
- B: 0.12 m
- C: 1.5 m
- D: 0.5 m

15. When the length of simple pendulum is doubled. find the ratio of of new frequency to the old frequency?

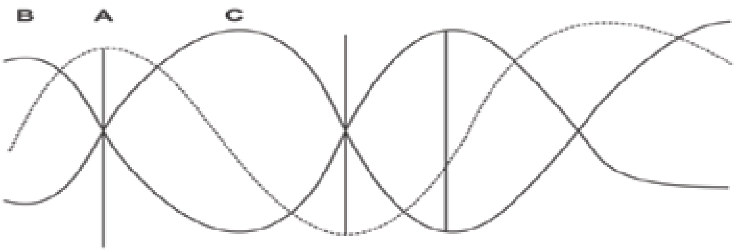
- A: 1/4
- B: 1/2
- C: $1/(2)^{1/2}$
- D: $(2)^{1/2}$

16. For the pendulum give below, at which point the velocity of the bob is minimum?



- A: A
- B: B
- C: C
- D: Both A and D.

Three progressive waves A, B and C are shown in the figure.



17. With respect to A, the progressive wave:

- A: B lags by π/2 and C leads by π/2
- B: B lags by π and C leads by π
- C: B leads by π/2 and C lags by π/2
- D: B leads by π and C lags by π

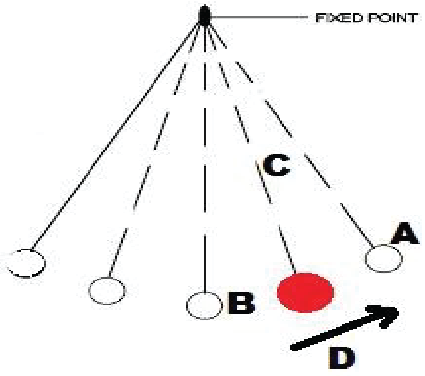
18. A body performs SHM with a period of 0.063 s. The max speed in this case is 3.0m/s . What will be the angular frequency?

- A: 16
- B: 48
- C: 96
- D: 100

19. Two waves have constructive interference when path difference Δs =?

- A: nλ/2 where n = set of integers.
- B: nλ where n = set of integers.
- C: (2n+1)λ/2 where n = set of integers.
- D: (2n+1)λ/3 where n = set of integers.

20. If the arrow shows the direction of motion of the pendulum at the instant marked red. What is the direction of the acceleration at that point?



- A: Towards A
- B: Towards B
- C: Towards C
- D: Towards D

OPTICS

TEST-1

1. Resolving power is expressed as inverse of ____________ .

- A: Radius of lens
- B: Magnification
- C: Focal length
- D: Minimum angle subtended at instrument by two points.

2. is a surface where all the points have same phase of vibration.

- A: Wave plane
- B: Wavelength
- C: Wave Front
- D: None of the above

3. The normal human eye can focus a sharp image of an object on the eye if the object is located at certain distance called:

- A: Least point
- B: Near point
- C: Far point
- D: Distinct point

4. A narrow slit produces a sequence of bright and dark fringes with a ____________ region at the center of the pattern.

- A: Dark
- B: Bright
- C: Shining
- D: None of the above

5. Sodium chloride in a flame gives out pure

- A: Green light
- B: Yellow light
- C: Red light
- D: Blue light

6. Light wave propogates in space by the ______________ .

- A: Stationary wave fronts
- B: Motion of wave fronts
- C: Parallel wave fronts
- D: None of the above

7. A line normal to the wave front is called ___________ .

- A: Ray of light
- B: Light source
- C: Moving light source
- D: Ray point

8. Central spot of Newtons rings are

- A: Dark for large wavelength
- B: Bright
- C: Bright for large wavelength
- D: Dark

9. The study of atomic structure of crystals by X rays was initiated in 1914 by.

- A: W.H Bragg and W.L Bragg
- B: W.L Bragg and W.I Bragg
- C: W.H Bragg and W.I Bragg
- D: W.H Bragg and Albert A. Michelson

10. The property of bending of light around an obstacle and spreading of light waves into geometric shadow of an obstacle is called:

- A: Diffraction
- B: Polarization
- C: Quantization of light
- D: Interference of light

11. The amplitude of the resultant wave after interference would be ____________ in case of destructive interference.

- A: Similar
- B: Greater
- C: Lesser
- D: None of the above.

12. The magnification of the virtual image of convex lens can be given by?

- A: M = 1 - d/f
- B: M = 1 - f/d
- C: M = 1 + f/d
- D: M = 1 + d/f

13. Proposed that light is a form of energy that travels in space as waves.

- A: Huygen
- B: Newton
- C: Einstein
- D: Galelio

14. The value of least distance vision for human eye is :

- A: 20cm
- B: 30cm
- C: 25cm
- D: 50cm

15. In the normal adjustment of compound microscope, the eye piece is positioned so that the final image is formed at :

- A: Optical center
- B: Infinity
- C: Principle focus
- D: Near point

16. According to __________ principle, every point of a wave front is a source of a secondary wave front.

- A: Einstein's
- B: Huygen's
- C: Euler's
- D: Young's

17. When seeing through Naked eyes, the aparent size of the object depends on which of the following?

- A: Lens
- B: Size of retina
- C: Angle subtended
- D: Iris

18. The branch of physics related to light is called _____________ .

- A: Light mechanics
- B: Optics
- C: Atomic physics
- D: Plasma physics

19. Optical active crystals rotates the

- A: vibrating plane
- B: polarization plane
- C: interference plane
- D: diffraction plane

20. A light with a wavelength of 600nm passes between two slits with a seperation of 2mm. The distance between the screen and slits is found to be 200cm. What should be the distance between two adjacent bright fringes?

- A: 1mm
- B: 0.6 mm
- C: 1.2 mm
- D: 4 mm

TEST-2

1. **The angular magnification "MA" produced by the combination of a particular eyepiece and objective can be calculated with**

   - A: $MA = \frac{f_o}{f_e}$
   - C: $MA = \frac{2\pi f_o}{f_e}$
   - B: $MA = \frac{f_e}{f_o}$
   - D: None of these

2. **The distance between two adjacent bright and dark fringes is mathematically written as:**

   - A: $\Delta Y = iL/d$
   - C: $\Delta Y = \gamma L/d$
   - B: $\Delta Y = i/dL$
   - D: $\Delta Y = d/\gamma L$

3. **In Michealson method to measure speed of light, the relation of "c" is:**

   - A: c = 8fd
   - C: c = 4 fd
   - B: c = 12 fd
   - D: c = 16 fd

4. **The distance between two consecutive bright or dark fringes, in Young's Double slit experiment, is given by:**

   - A: $\Delta y = \lambda L/3d$
   - C: $\Delta y = 2\lambda L/d$
   - B: $\Delta y = \lambda L/2d$
   - D: $\Delta y = \lambda L/d$

5. **When two waves travel in the same medium they will interfere:**

   - A: Constructively
   - C: Both the above can happen according to the phase.
   - B: Destructively
   - D: The waves can not interfere.

6. **For two convex lens compound Microscope, the Magnification is given by formula?**
   $M_1 = q/p$ and f_e is the focal length of eye piece.

   - A: $M = \frac{q}{p}\left(1 + \frac{f_e}{d}\right)$
   - B: $M = \frac{p}{q}\left(1 + \frac{f_e}{d}\right)$
   - C: $M = \frac{p}{q}\left(1 + \frac{d}{f_e}\right)$
   - D: $M = \frac{q}{p}\left(1 + \frac{d}{f_e}\right)$

7. **Polarization of light exhibited the nature of life as?**

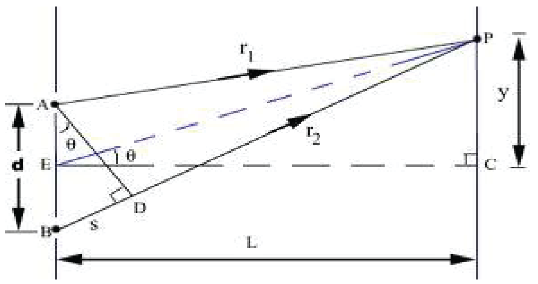
- A: Longitudnal wave
- B: Compressional wave
- C: Electromagnetic wave
- D: Transverse wave

8. **The concentration of sugar solution can be determined by?**

- A: Plane polarized light
- B: Unpolarized light
- C: Interference of light
- D: Diffraction of light

9. **It was ______________ whose experimental works proved that light travels as waves.**

- A: Einstein
- B: Newton
- C: Huygen
- D: Young



10. **In the figure above, the value of y for bright fringes can be given by;**

- A: y = 2Lλ / d
- B: y = mLλ / d
- C: y = mLλ / 2d
- D: y = 2mLλ / 3d

11. **Suppose in a young's double slit experiment, the slit seperation is 0.25cm, the distance between screen and slits is 100cm, the wavelength of light is 737.5nm and the distance from center to the bright fringe is 0.059cm. What is the number of that bright fringe?**

- A: 4th
- B: 3rd
- C: 2nd
- D: 1^{st}

12. **The resolution details of a microscope are dependant on which of the following?**

- A: Distance of object
- B: Width of objective
- C: Magnification
- D: All of the above

13. An object 15cm from a lens produces a real image 30 cm from the lens. What is the focal length of the lense?

- A: +15 cm
- B: + 20 cm
- C: +10 cm
- D: +25 cm

14. The refractive index of a prism can be measured by which of the following instruments?

- A: Telescope
- B: Spectrometer
- C: Collimator
- D: Young's double slit equipment

15. Michelson devised the Michelson's interferometer in

- A: 1882
- B: 1889
- C: 1891
- D: 1881

16. The Monochromatic light has which of the following properties:

- A: Single wavelength
- B: Single color
- C: Single frequency
- D: All of the above.

17. The information from one to another can be transmitted very safely and easily by:

- A: Copper wire
- B: Aluminium wire
- C: Optical fibers
- D: Photodiode

18. Image of object placed inside focal length of a convex lense will be largest and clearest, when it is at the :

- A: Nearest point
- B: Less than 25 cm
- C: Greater than 25 cm
- D: Infinity

19. In diffraction of light round an obstacle,the angle of diffraction is increased when:

- A: The wavelength of incident light wave is decreased
- B: The amplitude of the incident light wave is increased
- C: The wavelength of incident light wave is increased
- D: The amplitude of the incident light wave is decreased

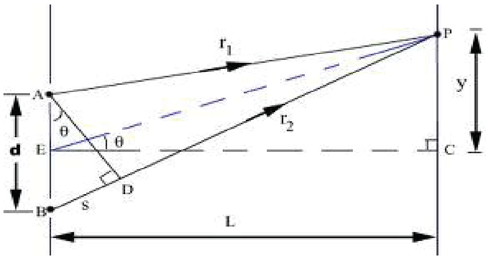
20. In the Galileo telescope the final image seen through the eyepiece is?

- A: Inverted.
- B: Erect.
- C: Virtual and Inverted.
- D: Erect and virtual.

TEST-3

1. **For a simple microscope, magnification is 10 and distance of the image is 45cm. What is the focal length of the lens?**

- A: 9 cm
- B: 6 cm
- C: 5 cm
- D: 18 cm



2. **In the figure given above, the value of "y" for dark fringes is given by**

- A: $y = \left(m + \frac{1}{3}\right)\frac{\lambda L}{d}$
- B: $y = (m+2)\frac{\lambda L}{d}$
- C: $y = \left(m + \frac{1}{2}\right)\frac{\lambda L}{d}$
- D: None of the above

3. **Which of the following can be utilized with the spectrometer so that it can be employed for measuring the wavelength of the light?**

- A: Microscope
- B: Convex lens
- C: Concave mirror
- D: Diffraction grating

4. **Refractive index of a material depends on which of the following?**

- A: Flexibility of the medium
- B: Specific heat of the medium
- C: Pressure of the medium
- D: Density of the medium

5. **The magnification of astronomical telescope is**

- A: $M = \frac{f_e}{f_o}$
- B: $M = \frac{f_e^2}{f_o}$
- C: $M = \frac{f_o^2}{f_e}$
- D: $M = \frac{f_o}{f_e}$

6. **In Young's double slit experiment, the relation for dark fringes is:**

- A: $(m + 1/2)\ \lambda = d \sin \Theta$
- B: $(m + 1/3)\ \lambda = d \sin \Theta$
- C: $m\ \lambda = d \sin \Theta$
- D: $1/2\ m\ \lambda = d \sin \Theta$

7. **Step-index optical fiber is generally made by doping high-purity of**

- A: Plastic
- B: Simple glass
- C: Titanium glass
- D: fused silica glass

8. **Which of these consist of a metallic tube with a convex lens at one end and adjustable slit on the other end?**

- A: Collimator
- B: Turn table
- C: Telescope
- D: All of them

9. **The angle subtended by any side of the eight sided mirror at the centre is**

- A: $\frac{2\pi}{8}$
- B: $\frac{4\pi}{8}$
- C: $\frac{2\pi}{7}$
- D: $\frac{2\pi}{6}$

10. **What are the units of optical power of a lens?**

- A: Decipher
- B: Diopter
- C: Watt
- D: It has no units.

11. **In order to observe the interference of light, the following must be done:**

The light beam must be monochromatic;

The light beams must be coherent;

The seperation between slits must be very large.

- A: 1 only
- B: 1 and 3 only
- C: 1 and 2 only
- D: 1, 2 and 3

12. **The beautiful colors formed by the oil film on the surface of water is result of __________ of light.**

- A: Refraction
- B: Reflection
- C: Interference
- D: None of the above.

13. A good telescope has an objective of __________ focal length and __________ aperture.

- A: Small; Large
- B: Long; Large
- C: Long; Small
- D: Small; Small

14. In Young's double slit experiment, the relation to get a bright fringe is:

- A: m (λ + 2) = d sin ϴ
- B: m (λ + 1/2) = d sin ϴ
- C: (m + 2) λ = d sin ϴ
- D: m λ = d sin ϴ

15. A wave front emitted from a slit will be _________ wavefront.

- A: Cylindrical
- B: Spherical
- C: Linear
- D: None of the above

16. Wavefronts have points with same____________ .

- A: Time period
- B: Amplitude
- C: Phase
- D: All of the above

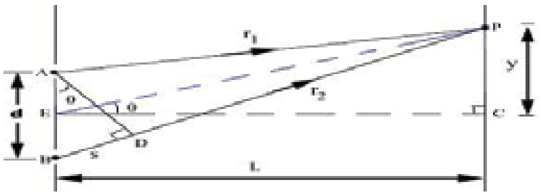
17. In a compound microscope the magnification by objective = 20 , magnification by eye piece =-11 the total magnification is :

- A: M =-220
- B: M = -0.19
- C: M = -0.05
- D: M=220

18. Coherent light sources refer to sources with the following features:

- A: Monochromatic with constant phase difference
- B: Monochroamtice with variable phase difference
- C: Non- monochroamtice with variable phase difference
- D: Non- monochroamtice with constant phase difference

19. What should be the distance between Slits and screen "L" for a light of wavelength of 589nm, the slit seperation to be 1mm so that the width of bright fringe is 1.33mm?



- A: 0.5 m
- B: 1 m
- C: 2.25 m
- D: 3.8 m

20. An oil film floating on water surface exhibits colour pattern due to phenomenon of ?

- A: Interference
- B: Polarization
- C: Diffraction
- D: Surface tension

TEST-4

1. **In Youngs double slit expriement if the separation of the slits is increased by two times, the fringe spacing?**

   - A: Remains same.
   - B: Decrease by half.
   - C: Increase by two times.
   - D: Increase by four times.

2. **The linear magnification produced by a lens is defined as the ratio of the:**

   Size of image to the size of object

   Size of the lens to the size of the object

   Size of the lens to the size of the image

   - A: I only
   - B: II only
   - C: III only
   - D: I,II,III

3. **The most common method to produce polarized light through dichroic substances is?**

   - A: Reflection from other surfaces
   - B: Refraction through crystals
   - C: Scattering by small particles
   - D: Selective Absorption

4. **The focal length of concave lens of power -2.D is**

   - A: 5m
   - B: -0.5m
   - C: 0.5cm
   - D: 0.005m

5. **During Young's double slit experiment, the dark fringes are formed due to :**

   - A: Constructive Interference
   - B: Destructive Interference
   - C: Refraction
   - D: Total internal reflection

6. **The first attemts to measure the speed of light were done by which of the following scientists?**

   - A: Newton
   - B: Einstein
   - C: Graham Bell
   - D: Galileo

7. **A usual way of obtaining a plane wave is to place a point of light source infront of a ___________ .**

   - A: Concave lens
   - B: Convex lens
   - C: Concave mirror
   - D: Convex mirror

8. For a young person, the near point is situated approximately how many cm from the eye.

- A: 10 cm
- C: 20cm
- B: 15 cm
- D: 25 cm

9. The layer with less refractive index in multi mode step index is called?

- A: Cladding
- C: Index fibre
- B: Monochrome
- D: Second step

10. If magnification of objective lens and eye piece are M_1 and M_2respectively. The magnification of the compound microscope can be given by?

- A: $M = M_1.M_2$
- C: $M = M_1 - M_2$
- B: $M = M_1 + M_2$
- D: $M = M_1/M_2$

11. The resolving power of a grating spectrometer is give by?

- A: $R = \lambda/\Delta\lambda$
- C: $R = \Delta\lambda/\lambda^2$
- B: $R = \Delta\lambda/\lambda$
- D: $R = \lambda^2/\Delta\lambda$

12. In youngs double slit experiment, slit separation d = 0.65cm, distance between slit and screen is L = 200cm and distance of fringe separation is y = 0.13cm , wavelength of light ray will be :

- A: $\lambda = 1.33 \times 10^{-3} m$
- C: $\lambda = 4.55 \times 10^{-3} m$
- B: $\lambda = 3.25 \times 10^{-7} m$
- D: $\lambda = 5.11 \times 10^{-3} m$

13. For interference of light waves to take place, the required condition is:

- A: The path difference of light waves from the two sources must be large.
- B: The interfering waves must be non-coherent.
- C: The light waves may come from different sources.
- D: The light waves may come from two coherent sources.

14. The index of refraction of a material is given by?

- A: n = c * v
- C: n = v/c
- B: n = c/v
- D: $n = c^v$

15. In diffraction grating, the first order image of the grating will be formed when d sin Θ = ?

- A: 0
- B: 1
- C: λ
- D: λ/2

16. Optical microscopes have refractive glass and occasionally of

- A: Crystal and plastic
- B: Crystal and Quartz
- C: Plastic and Quartz
- D: Glass and Quartz

17. The Telescope is made of an objective of focal length 20cm and eye piece of 5.0 cm both convex . Its angular magnification is ?

- A: 5.4 cm
- B: 9.5 cm
- C: 4.0 cm
- D: 4.5 cm

18. Magnifying power is also known as ?

- A: Angular magnification
- B: Linear Magnification
- C: Subtended Magnification
- D: All of the above.

19. The property of light to bend around obstacles and spread into geometrical shadow is called?

- A: Reflection
- B: Interference
- C: Refraction
- D: Diffraction

20. Which of the following results in the power loss in the fibre optics?

- A: Scattering
- B: Absorption
- C: Splice and connector loss
- D: All of the above

HEAT & THERMODYNAMICS

TEST-1

1. **Which of the following explains the behavior of gasses?**

- A: Bernoulli's theorum.
- B: Isothermal processes
- C: Kinetic theory.
- D: Borwnian motion.

2. **Energy can be added to a gas in a cylinderical container through?**

- A: Heat transfer
- B: Mechanical work
- C: Applying pressure
- D: All of the above.

3. **Which of the following is true for an isothermal process?**

- A: Product of P & V remains constant.
- B: Change in internal energy = 0
- C: Q=W
- D: All of the above.

4. **Which of the following statement is true?**
   1. One kilogram of different substances contains different number of molecules.
   2. One mole of different substances contains same number of molecules.

- A: A only.
- B: B only.
- C: Both A & B,
- D: Both A & B are incorrect.

5. **Triple point of water is?**

- A: Independent of the temperature and pressure.
- B: Dependent on the temperature and pressure.
- C: The point where all three states of water co-exist.
- D: Both B & C.

6. **Which of the following is the definition of the molar specific heat of a substance?**

- A: Heat required to raise the temperature of 1 Kg of the substance through 1 K.
- B: Heat required to raise the temperature of 1 mole of the substance through 1 K.
- C: Heat required to raise the temperature of 1 mole of the substance through 1 C.
- D: Heat required to raise the temperature of 1 Kg of the substance through 1 C.

7. **The unit of temperature in base unit is :**

- A: Celsius
- B: Degree
- C: Kelvin
- D: Fahrenheit

8. **Which of the following is true about the pressure of the gasses?**

- A: $P \alpha K.E$
- B: $P \alpha Temperature$
- C: $P \alpha V$
- D: Only A & B

9. Thermal pollution is an inevitable consequence of?

- A: First law of thermodynamics.
- B: Second law of thermodynamics.
- C: Both A & B.
- D: Charles Law.

10. In the general equation PV=nRT, n is the number of moles of gas. Which one of the following represents the relationship of n?

- A: NxN_A
- B: N/N_A
- C: N_A
- D: nN_A

11. Heat can not be converted entirely into work. This statement can be derived from?

- A: First law of thermodynamics.
- B: Second law of thermodynamics.
- C: Third law of thermodynamics.
- D: Both A & B.

12. In adiabatic process PV^{Υ}= Constant. Υ is defined as?

- A: Boyle's constant.
- B: Ratio of molar specific heat of gas at constant pressure to molar specific heat at constant volume.
- C: Ratio of molar specific heat of gas at constant pressure to molar specific heat at constant temperature.
- D: Ratio of molar specific heat of gas at constant temperature to molar specific heat at constant volume.

13. What is 273K on celcius scale ?

- A: $0.15^{o}C$
- B: $- 0.15^{o}C$
- C: $273^{o}C$
- D: $- 273^{o}C$

14. Boyle's law state that?

- A: Pressure is directly proportional to volume at constant temperature.
- B: Pressure is inversely proportional to volume at constant temperature.
- C: Pressure is directly proportional to volume at variable temperature.
- D: Pressure is inversely proportional to volume at variable temperature.

15. Gas pushes the piston doing work of 700J. If the process is isothermal which of the following is true?

- A: Heat of 700J is transferred to the surroundings.
- B: Heat of 700J is transferred to the system.
- C: Temperature of the system decreases.
- D: Heat transfer in this process is less than 700J.

16. Which of the following is a basic postulate/s of the mathematical model of gasses?

- A: Gass molecules are always in random motion.
- B: Gas molecules do not exert force on each other except during a collision.
- C: V = T * Constant
- D: Both A & B

17. All natural processes move towards?

- A: Stable net entropy.
- B: Decrease in net entropy.
- C: Increase in net entropy.
- D: None of the above.

18. When heat is added to the system it appears as?

- A: Increase in internal energy of the system and work done on the system by the surroundings.
- B: Decrease in internal energy of the system and work done by the system on the surroundings.
- C: Increase in internal energy of the system and work done by the system on the surroundings.
- D: Decrease in internal energy of the system and work done on the system by the surroundings.

19. If a gass is compressed through a 300 J work. The internal energy of the system for adiabatic process will?

- A: Increase by 300 J
- B: Decrease by 300 J
- C: Remain same
- D: Need information about the heat exchanged in the process.

20. Which of the following is a basic postulate of the mathematical model of gasses?

- A: Molecules do not exert force on each other except during a collision.
- B: PV = nRT
- C: Gasses have inelastic collisions with the boundary of the container.
- D: All of the above.

TEST-2

1. In a Carnot engine, when $T_2 = 0^0C$ and $T_1 = 200^0C$, its efficiency is n_1. When $T_1 = 0^0C$ and $T_2 = -200^0C$, efficiency is n_2, what is n_1/n_2 ?

- A: 0.57
- B: 0.64
- C: 0.73
- D: None of the above.

2. Boltzman constant relates which two values?

- A: Volume of the gas with energy.
- B: Energy of the gas with temperature.
- C: Volume of the gas with temperature.
- D: Energy of the gas with moles

3. A gas sample contains three molecules each having speeds 1m/s, 2m/s and 3m/s. What is the mean square speed?

- A: 14/3 m/s
- B: 6 m/s
- C: 2 m/s
- D: $(14/3)^{1/2}$ m/s

4. If 'Q' is the amount of heat supplied to a system and ' W' is work done , then change in internal energy can be defined as:

- A: Q-W
- B: Q/W
- C: W/Q
- D: 1+ Q/W

5. In an adiabatic process, a gas expands against a piston. Which of the following statement is true?

- A: No work is done in the process.
- B: Internal energy remains constant.
- C: Molecules linear velocity increases.
- D: Temperature of the gas falls.

6. In a thermodynamic process, pressure of a fixed mass of the gas is changed in such a manner that the gas molecules give out 30 J of heat. Also, 10 J of work is done on the gas. If the internal energy of the gas was 40 J, what will be the final internal energy?

- A: 20 J
- B: -20 J
- C: 80 J
- D: 60 J

7. Boltzman constant is defined as $k = R / N_a$. R and N_a are?

- A: R=gas constant, N_a=Number of moles of gas
- B: R=Rigidity of gas, N_a=Number of moles of gas
- C: R=gas constant, N_a=Absolute number of moles at temperatue T
- D: R=gas constant, N_a=Avogrado number

8. For a given temperature speed of gas molecules is?

- A: $v = \sqrt{\frac{3kT}{2m}}$
- B: $v = \sqrt{\frac{2kT}{3m}}$
- C: $v = \frac{3kT}{2m}$
- D: $v = \sqrt{\frac{3kT}{m}}$

9. Which of the following is the expression of root mean square speed of a gas having n number of molecules contained in a container?

- A: sq.root $(v_1^2 + v_2^2 + v_3^2 .... + v_n^2)/N$
- B: $(v_1^2 + v_2^2 + v_3^2 .... + v_n^2)/N$
- C: sq.root $(v_1 + v_2 + v_3 .... + v_n)/N$
- D: $(v_1 + v_2 + v_3 .... + v_n)/N$

10. A heat engine operating according to second law of thermodynamics rejects one fourth of the heat taken from high temperature reservior. What is the percentage efficiency of engine?

- A: 25%
- B: 50%
- C: 75%
- D: 100%

11. A gas at 300K, enclosed in a constainer, is put in a fast moving train. When the train moves, the temperature of gas?

- A: Rises above 300K
- B: Falls below 300K
- C: Remains same.
- D: Become unsteady.

12. H_2 and O_2 both are at thermal equilibrium at temperature 300K. Oxygen is 16 times massive than Hydrogen. Root mean square speed of hydrogen is:

- A: 1/4 root mean square of oxygen
- B: 4 root mean square of oxygen
- C: 1/16 root mean square of oxygen
- D: 16 root mean square of oxygen

13. Two baloons are filled, one with pure He gas and the other by air, respectively. If the pressure and temperature of these balloons are same then the number of molecules per unit volume is :

- A: More in He filled baloon as He is lighter than air.
- B: Same in both baloons.
- C: More in air filled baloon.
- D: in the ratio of 1:5.

14. In a thermodynamic process, pressure of a fixed mass of a gas is changed in such a manner that the gas molecules give out 30 J of heat and 10 J of work is done on the gas. If the initial internal energy of the gas was 40 J, then the final internal energy will be:

- A: 20 J
- B: 30 J
- C: 40 J
- D: 50 J

15. Which of the following is the evidence in favour of kinetic theory?

- A: Diffusion of gases
- B: Brownian motion
- C: Enthalpy
- D: Both A & B

16. The total translational kinetic energy of all the molecules of a given mass of an ideal gas is x times the product of its pressure, and its volume. The value of x is?

- A: 2/3
- B: 1/3
- C: 3/2
- D: 1/2

17. A 50 g cube of ice is added to 500 g of boiling water. Which of the following is most likely to occur?

- A: The ice cube vaporizes before it strikes the bottom of the container.
- B: The water boils more vigorously because the hot water draws cold from the ice cube.
- C: The water in the container stops boiling during the phase change of the ice to water.
- D: The more dense ice cube sinks in the less dense hot water.

18. Pressure exerted by gas on the walls of a cylinderical container can be defined as?

- A: Momentum transferred to the walls due to to intra-collion of gas molecules.
- B: Phenomena due to the fact that distance of gas molecules is much larger than the size of molecules themselves.
- C: Momentum transferred to the walls due to to collion of gas molecules with the wall.
- D: Diffusion of gases in a the cylinderical container.

19. Work done by an expanding piston can be calculated by?

- A: P * Change in volume of the gas.
- B: Area under the PV curve.
- C: $\int_a^b P dv$
- D: All of the above.

20. First law of thermodynamics under adiabatic conditions can mathematically be written as:

- A: Q= W
- B: Q= ΔU
- C: W= -ΔU
- D: Q=U+W

TEST-3

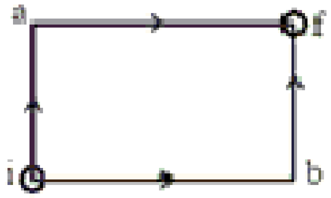
1. If absolute temperature of a gas container is increased by 4 times and the volume of the container is decreased by 5 times, the pressure of the gas on the container?

- A: Increase by 4 times.
- B: Increase by 5 times.
- C: Increase by 20 times.
- D: Decrease by 20 times.

2. The pressure and density of a gas is changed adiabatically from (P1 & ρ_1) to (P2 & ρ_2). If ρ_2/ρ_1 = 32 then the ratio of P2/P1 should be? Assume Υ=7/5.

1. A: 16
2. B: 32
3. C: 64
4. D: 128

3. When a system is taken from state i to state f along the path iaf, it is found that Q = 50 J and W = 20 J. Along the path ibf, if Q = 36 then W = ?



1. A: 66 J
2. B: 14 J
3. C: 6 J
4. D: 16 J

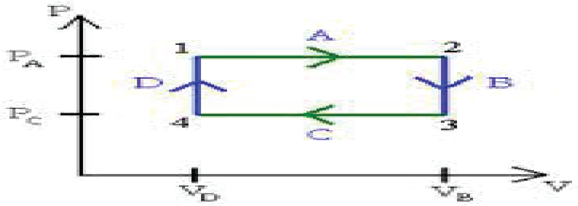
4. A Carnot engine whose low temperature reservoir is at 27^{0}C has an efficiency of 50%. If it is desired to increase the efficiency to 60% then, by how many degrees should the temperature of the high temperature reservoir be increased?

1. A: 600 K
2. B: 500 K
3. C: 250 K
4. D: 150 K

5.A Carnot engine absorbs an amount Q of heat from a reservoir at an absolute temperature T and rejects heat to a sink at a temperature of T/3. The amount of heat rejected is :

1. A: Q/4
2. B: Q/3
3. C: Q/2
4. D: 2Q/3

6.Which of the following statement is true for the figure below,



1. A: Work done in moving from 1-3 is more than work done in moving from 3-1.
2. B: Work done in moving from 1-3 is same as work done in moving from 3-1.
3. C: In moving from 1-3 surroundings do work on the system.
4. D: Total work done by the system is zero.

7. Heat engine performs 100 J of work and rejects 400 J of heat to the sink. What is efficiency of the engine?

1. ○ A: 20%
2. ○ B: 30%
3. ○ C: 40%
4. ○ D: 45%

8. For a heat engine 'A' ratio of Q_2 to Q_1 is 2/3 while that of heat engine 'B', ratio of Q_2 to Q_1 is 1/3. What is the value of $\eta_A : \eta_B$?

1. ○ A: 1:3
2. ○ B: 1:2
3. ○ C: 2:3
4. ○ D: 2:1

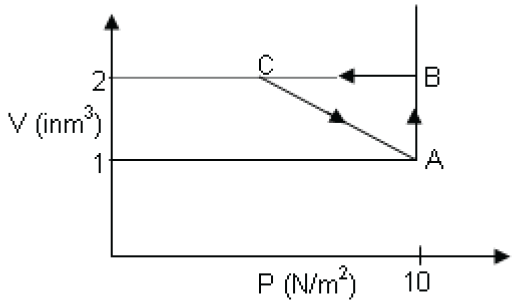
9. At triple point of water , the pressure of gas is 2680 Pa. By changing the T the pressure changed to 4870 Pa. The value of T is?

1. ○ A: 496 K
2. ○ B: 438 K
3. ○ C: 0
4. ○ D: 438 F

10. If absolute temperate of a gas container is increased by 4 times and the volume of the container is also increased by 4 times, the pressure of the gas on the container?

1. ○ A: Remains same.
2. ○ B: Increase by 4 times.
3. ○ C: increase by 8 times.
4. ○ D: Increase by 16 times.

11. An ideal gas is taken through the cycle A → B → C → A, as shown in figure. If the net heat supplied to the gas in the cycle is 5 J, the work done by the gas in the process. C → A is?



1. ○ A: -5J
2. ○ B: -10J
3. ○ C: -15J
4. ○ D: -20J

12. If velocity of gas particles for two different gases is same. The pressure is directly proportional to? Assume volume of the container is same.

○ A: Mass of the gas molecules
○ B: Absolute Temperature
○ C: Size of piston on the container.
○ D: Both A & B.

13. An engine has an efficiency of 1/6. When the temperature of sink is reduced by 62^0C, its efficiency is doubled. Temperature of the source is:

○ A: 372^0C
○ B: 269^0C
○ C: 124^0C
○ D: 99^0C

14. Temperature of ideal gas is increased from 120 K to 480 K. If root mean square of velocity is V at 120 K then what is root mean square at 480 K?

1. A: 4V
2. B: 2V
3. C: V/2
4. D: V/4

15. A heat engine according to second law of thermodynamics has 50% efficiency. What will be the temperature of its low temperature reservoir if high temperature reservior is 327 C ?

1. A: 27 C
2. B: 127 C
3. C: 300 C
4. D: 600 C

16. A reversible engine works between two temperatures whose difference is 200 ^oC. If it absorbs 746 J heat from source and and rejects 546 J to the sink. What is temperature of the source?

1. A: 100 ^oC
2. B: 273 ^oC
3. C: 373 ^oC
4. D: 473 ^oC

17. Translational KE for gas molecules at temperature T for one mole of a gas is?

1. A: (3/2) RT
2. B: (9/2) RT
3. C: (2/3) RT
4. D: (1/3) RT

18. Starting with the same initial conditions, an ideal gas expands from volume V_1 to V_2 in three different ways. The work done by the gas is W_1 if the process is purely isothermal; W_2, if purely isobaric, and W_3 ,if purely adiabatic. Then:

1. A: W2>W1>W3
2. B: W2>W3>W1
3. C: W1>W3>W2
4. D: W1>W2>W3

19. Which of the following is a correct relationship between pressure, density and molecular velocity of gas?

- A: $P = \frac{1}{2}\rho v^2$
- B: $P = \frac{3}{2}\rho v^2$
- C: $P = \frac{1}{3}\rho v^2$
- D: $P = \frac{2}{3}v^2/\rho$

20. Internal energy of the ideal gas is equal to translational KE based on which of the following assumptions?

1. A: Ideal gases expand when heated.
2. B: Molecules of ideal gas exert constant force on each other.
3. C: Molecules of ideal gas exert no force on each other.
4. D: Both A & B

TEST-4

1 **If velocity of the gas particles increases by twice. The pressure exerted by the gas?**

- A: Increase by two times
- B: Decrease by two times
- C: Increasy by four times
- D: Decrease by four times.

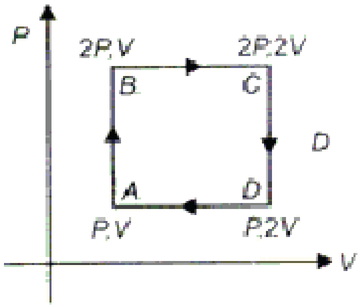
2 **For isothermal process, change in internal energy is?**

- A: Always positive.
- B: Always Negative
- C: Zero.
- D: Equal to the work done.

3 **At a given temperature entropy change is directly proportional to?**

- A: At a constant temperature entropy remains constant.
- B: Work done.
- C: Heat transfer.
- D: Change in pressure.

4 **An ideal monoatomic gas is taken around the cycle ABCDA, as shown in PV diagram. The work done during the cycle is given by:**



- A: 1/2 PV
- B: PV
- C: 2PV
- D: 4PV

5 **At what scale both Celsius and Fahrenheit give the same reading?**

- A: -100
- B: -90
- C: -40
- D: 0

6 **For irreversible processes?**

- A: Entropy increases.
- B: Entropy decreases.
- C: Entropy remains constant.
- D: None of the above.

7 When the state of gas changes without change in temperature, the gass is said to undergo :

- A: Isothermal process
- B: Adiabetic process
- C: Isochoric process
- D: Isobaric process

8 Internal energy of an ideal gas system is equal to?

- A: Kinetic energy of the molecules.
- B: Potential energy of the molecules.
- C: Absolute temperature of the gas.
- D: Vibrational + Rotational energy.

9 Keeping every thing constant, if the volume of a container is doubled the pressure?

- A: Remains same.
- B: Halves
- C: Doubles
- D: Increase four times.

10 In the expression P = Constant * K.E. The constant is equal to?

- A: 1/3 * Number of molecules per unit volume
- B: 2/3 * Number of molecules per unit volume
- C: 2/3 * Number of molecules in the container
- D: 1/3 * Number of molecules in the container

11 Molar specific heat of the gases is defined at constant volume or constant pressure because?

- A: This is required by the 2nd law of thermodynamics.
- B: To account for the universal gas constant (R)
- C: Rise in temperature results in the change in volume or pressure of the gasses.
- D: $C_p > C_v$

12 Which of the following statement is true?

- A: Work done on the system is positive and work done by the system is negative.
- B: Work done on the system is negative and work done by the system is positive.
- C: Work done on the system and by the system is always positive.
- D: Heat transferred to the system is negative and heat transferred from the system to surroundings is positive.

13 Which of the following is true about carnot engine?

- A: Its efficiency is 100%
- B: There is no change in internal energy.
- C: Its efficiency depends on the nature of working substance.
- D: Both B & C.

14 Which of the following could be assumed as adiabatic process?

- A: Constant mixing of hot gas with cold gas.
- B: Rapid expansion of air.
- C: Slow expansion of air.
- D: Steam formation in the steam engine.

15 **Which of the following is true for the molar specific heat of the gases?**

- A: ΔU for $C_p > \Delta U$ for C_v
- B: ΔU for $C_p < \Delta U$ for C_v
- C: ΔU for $C_p = \Delta U$ for C_v
- D: Not enough information given to make any conclusion about ΔU for C_p and C_v

16 **We can not use the heat of oceans to convert it to work because?**

- A: Oceans are too large.
- B: Heat content is too big to handle.
- C: There is no heat sink available.
- D: Both A & C.

17 **In the expression PV=nRT, n is defined as?**

- A: 2/3 * number of molecules per unit volume.
- B: Moles of gas contained in volume V at absolute temperature T = 0.
- C: Moles of gas contained in volume V at absolute temperature T.
- D: Moles of gas contained in volume V at temperature T.

18 **Mathematical model of gases makes which of the following assumptions?**

- A: A finite volume of gas consists of very large number of molecules.
- B: The size of molecules is much smaller than the seperation of the molecules.
- C: Collision between gas molecules is perfectly elastic.
- D: All of the above.

19 **Sum of all forms of molecular energy is also known as?**

- A: Kinetic Energy
- B: Potential Energy
- C: Internal Energy
- D: Total Energy

20 **What will be the mathematical form of first law of thermodynamics for a system whose variation of volume by pressure is shown? (The graph is for an isothermal process)**

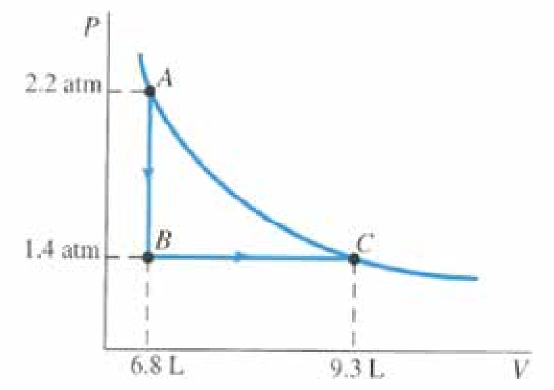


FIGURE 15-27 Problem 9.

- A: Q=U
- B: U=W
- C: Q=U/W
- D: Q=W

ELECTROSTATISTICS

TEST-1

1. **Capacity of a capacitor depends upon?**

   - A: Size of plate
   - B: Distance between plates
   - C: Nature of dielectric between plates
   - D: All of the above.

2. **If σ is the uniform surface charged density then electric field intensity due to an infinite sheet of charge is?**

   - A: $\sigma * 2\varepsilon_0$
   - B: $\sigma * \varepsilon_0$
   - C: $\sigma / 2\varepsilon_0$
   - D: σ / ε_0

3. **Gravitational force does not depend on?**

   - A: Distance
   - B: Mass
   - C: Medium
   - D: It depends on all of the above.

4. **A basic technique when applying gauss's law is to?**

   - A: Assume the field is constant in direction
   - B: Assume the field is constant is magnitude
   - C: Assume the field is constant in both magnitude and direction
   - D: Construct and imaginary surface around the charge

5. **A capacitor may be considered as a device for?**

   - A: Storing energy.
   - B: Increasing resistance.
   - C: Decreasing resistance.
   - D: None of the above.

6. **If a mica sheet is place between the plates of a capacitor, its capacitance will?**

   - A: Increase.
   - B: Decrease.
   - C: Remain same.
   - D: None of the above.

7. **The electric intensity is expressed in unit of N/C or?**

   - A: V/m
   - B: Joules
   - C: V.m
   - D: None of the above.

8. Number of electric field lines per unit area passing parallel to Guassian surface is?

- A: Directly proportional to the magnitude of electric field.
- B: Inversely proportional to the magnitude of electric field.
- C: Directly proportional to the electric flux density.
- D: Zero.

9. Constant of proportionality k in the formula for force between the two charges depends on?

- A: Value of the charge.
- B: Nature of medium between the charges.
- C: Source of electric field.
- D: Both B & C.

10. Which of the following is true about electric field lines?

i) Electric field lines start from positive charge and end on negative charge.
ii) Tangent to the field line gives the direction of field at that point.
iii) Electric field lines never cross each other.

- A: i only.
- B: ii only
- C: i and ii only
- D: i, ii and iii.

11. The force per unit charge is known as?

- A: Electric flux
- B: Electric potential
- C: Electric field intensity.
- D: Electric current.

12. Which of the following is a vector quantity?

- A: Electric Charge
- B: Electric Field
- C: Electric Potential
- D: Electric Current

13. Which of the following is a field free region?

- A: Outside a hollow charged shere.
- B: Inside a hollow charged shpere.
- C: Near an infinite sheet of charge
- D: In the middle of two opposite charged plates.

14. What are the SI units of electric field intensity?

- A: N/C
- B: V/C
- C: NC
- D: VC

15. Total electric flux through a closed surface depends upon?

i) Charge enclosed   ii) Medium   iii) Geometry of the surface

- A: i only
- B: ii only
- C: i and ii only
- D: i, ii and iii.

16. If work done on moving a unit positive charge from point A to B in an electric field is 5J the potential difference between A and B is?

- A: 1 V
- B: 5 V
- C: 10 V
- D: We need information about electric field intensity to give an answer.

17. Two charged spheres are separated by 2 mm. Which of the following would yield the greatest attractive force?

- A: +1q and +4q
- B: –1q and –4q
- C: +2q and +2q
- D: +2q and –2q

18. The energy stored in the capacitor is?

- A: ½ CV^2
- B: ½ C^2 V
- C: ½ QV^2
- D: ½ Q^2V

19. Presence of di-electric?

- A: Reduces the electrostatic force between charged particles.
- B: Increases the electrostatic force between charged particles.
- C: Has no effect on the electrostatic force between charged particles.
- D: May increase or decrease the electrostatic force between charged particles.

20. The value of minimum possible charge is?

- A: 1 C
- B: 1.6×10^{-19} C
- C: 3.2×10^{-19} C
- D: There is no such value as minimum possible charge.

Test-2

1. **What will be the effect on the capacitance of the capacitor if area of each plate is double while separation between the plates is halved?**
   - A: Capacitance remains same
   - B: Capacitance becomes double
   - C: Capacitance reduces to half
   - D: Capacitance becomes four times

2. **To measure an electric field, the test charge q_0 has to be very small because?**
   - A: Large charge may distort the field to be measure.
   - B: Electric field is only measureable for small charges.
   - C: Small charges provide inexpensive way of measuring electric field.
   - D: None of the above.

3. **Time constant for capacitor is defined as?**
   - A: Time taken by the capacitor to deposit 0.25 times the equilibrium charge.
   - B: Time taken by the capacitor to deposit 0.47 times the equilibrium charge.
   - C: Time taken by the capacitor to deposit 0.63 times the equilibrium charge.
   - D: Time taken by the capacitor to deposit 0.75 times the equilibrium charge.

4. **If distance between two charges is increased by 3 times the electrostatic force between them?**
   - A: Increases by 3 times
   - B: Decreases by 3 times.
   - C: Increases by 9 times
   - D: Decreases by 9 times.

5. **The charge determined by the Milikan's experiment is given by?**
   - A: mgd / V
   - B: m / gdv
   - C: md / dV
   - D: mV / dg

6. **Which of the following statement is true?**
   - **i) Both gravitational and electrical forces are inversely proportional to distace between points.**
   - **ii) Gravitational is much weaker than electrical force**
   - **iii) Electrical force and gravitational force are both medium dependent**

   - A: i only
   - B: i and ii only
   - C: i and iii only
   - D: i, ii and iii only.

7. **Two opposite charges of C columb are separated by distance D. What is the electric potential at midway between them?**
   - A: Zero
   - B: C / D^2
   - C: C / D
   - D: $(1 / 4\pi\varepsilon_0)\ C / D^2$

8. The force between two charges is 8N. If a medium of relative permitvity 4 is placed between the two charges, the force is reduced to?

- A: 1 N
- B: 2 N
- C: 4 N
- D: Zero.

9. Mathematically Guass's law can be expressed as?

- A: $\Phi_e = \int E.dA$
- B: $\Phi_e = E.A$
- C: $\Phi_e = EAcos\theta$
- D: All of the above.

10. The ratio of C_{vac} and C_{med} is equal to?

- A: ε_0
- B: $1 / \varepsilon_0$
- C: ε_r
- D: $1 / \varepsilon_r$

11. Which of the following is not a vector quantity?

- A: Electric field intensity.
- B: Electric force
- C: Electric flux.
- D: All of the above are vector quantities.

12. If two capacitors of value 10 mili F and 100 mili F are connected in parallel. Total capacitance is?

- A: 9 mili F
- B: 10 mili F
- C: 100 mili F
- D: 110 mili F

13. The ratio of the force between two small spheres (A) in air : (B) in a medium of dielectric constant K is? (The spheres have constant charge.)

- A: 1 : K
- B: K : 1
- C: $1 : K^2$
- D: $K^2 : 1$

14. An electric field can deflect?

- A: X rays
- B: Neutrons.
- C: Gamma rays
- D: Alpha rays.

15. If charge on the particle is increased four times, the electric field?

- A: Increase by two times.
- B: Decrease by two times.
- C: Increase by four times.
- D: Remains same.

16. A particle of charge 2e falls through a potential difference of 6 V. Calculate the energy acquired by it?

- A: 2 eV
- B: 3 eV
- C: 6 eV
- D: 12 eV

17. There are two charges 1 uc and 6 uc are place in similar electric field at same distance from the source. The ratio of forces acting on them will be?

- A: 1 : 1
- B: 1 : 36
- C: 1 : 6
- D: 6 : 1

18. When capacitors are connected in parallel the net capacitance will?

- A: Decrease
- B: Increase
- C: Remain same
- D: Become zero.

19. The displacement of a charge Q in the electric field $\vec{E} = e_1\hat{i} + e_2\hat{j} + e_3\hat{k}$ is $\vec{r} = a\hat{i} + b\hat{j}$. The work done is:

- A: $w = ae_1 + be_2$
- B: $w = (ae_1 + be_2)^{0.5}$
- C: $w = ae_1 + be_2 + e_3$
- D: $w = ae_1 + be_2 * (a+b)$

20. The Coulomb's force between two charges q_1 and q_2 separated by distance 'r' is F. If the separation between two charges is doubled keeping charges constant, then Coulomb's force becomes?

- A: 2F
- B: F/2
- C: 4F
- D: F/4

TEST-3

1. Relative permitivity of three materials is given below. Which one would have highest electrostatic force for charged particles in that medium, keeping all other factors constact?

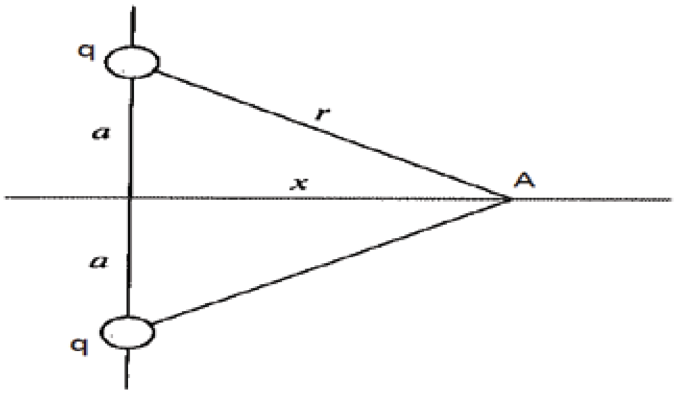
Mica = 4
Glass = 10

- A: Germanium
- B: Glass
- C: Mica
- D: All would have same value of electrostatic force.

2. If three charges 2q, - q and - q are located at the vertices of an equilateral triangle then at the circumcentre of the triangle?

- A: The electric field is zero but the electric potential is non zero.
- B: The electric potential is zero and the electric field is infinity
- C: Both the electric field and the electric potential are zero
- D: The electric field is non zero but electric potential is zero

3. Find electric potential at point A due to two positive charges q seperated by distance a as shown in the figure?



- A: Zero.
- B: $(1 / 4\pi\varepsilon_0) * q/ (a^2 + x^2)^{-2}$
- C: $2 * (1 / 4\pi\varepsilon_0) * q/ (a^2 + x^2)^{1/2}$
- D: $(1 / 4\pi\varepsilon_0) * q/ (a^2 + x^2)$

4. How many electrons are there in 1 columb of charge?

- A: Zero.
- B: 3.1×10^{19}
- C: 1.9×10^{19}
- D: 6.2×10^{18}

5. If the distance between a point charge and an infinitely large charged plate is increased by a factor of 2, the new force on the point charge will?

- A: Increase by a factor of 2.
- B: Decrease by a factor of 2.
- C: Decrease by a factor of 4.
- D: Remain same.

6. The potential at a point x (measured in μm) due to some charges situated on the x'-axis is given by $V(x) = 20/(x^2 - 4)$ volts. The electric field E at x = 4 μm is given by

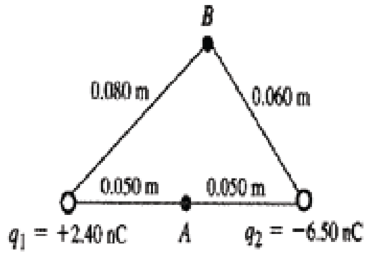
- A: 10 / 9 along -ve x direction
- B: 10 / 9 along +ve x direction
- C: 5 / 3 along +ve x direction
- D: 5 / 3 along -ve x direction

7. The electric potential at a point of distance 1 m from 2 uc charge is?

- A: $1.8 * 10^5$ V
- B: $1.8 * 10^4$ V
- C: $3.6 * 10^8$ V
- D: $3.6 * 10^6$ V

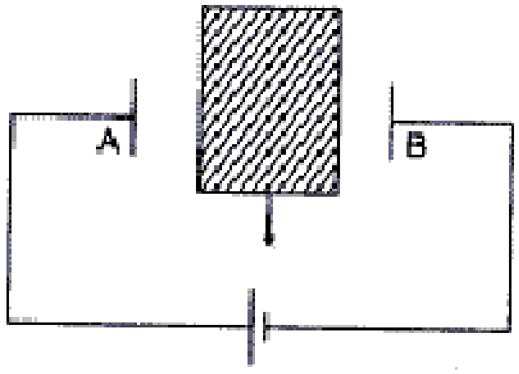
8. The locations of the charges and points *A* and *B* are sketched in Figure

Find Potential at Point A?



- A: -328 V
- B: - 737 V
- C: -839 V
- D: - 920 V

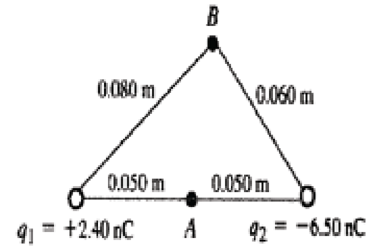
9. For the figure below, an insulator plate is slowly placed between the plates of a capacitor and then removed. The current?



- A: first flows from A to B, and then from B to A
- B: first flows from B to A, and from A to B
- C: always flows from B to A
- D: always flows from A to B

10. The locations of the charges and points *A* and *B* are sketched in Figure

Find Potential at Point B?

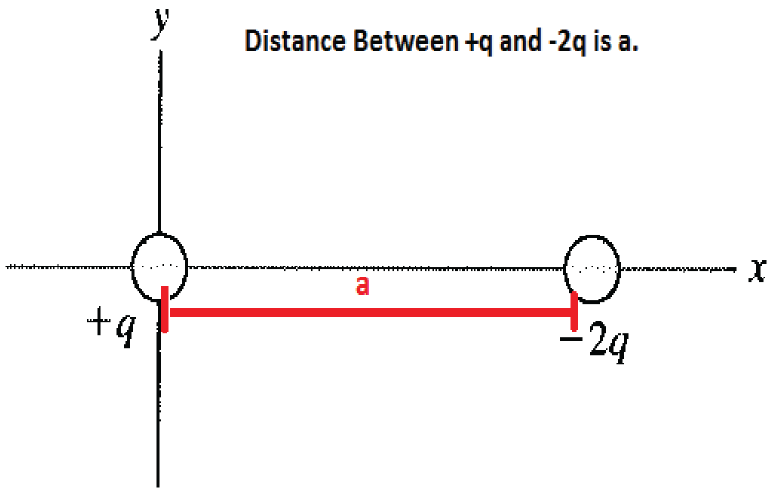


- A: - 704 V
- C: - 841 V
- B: - 737 V
- D: + 365 V

11. Two positive charges of charge q columb are separated by distance d. What is the absolute potential at miday between them?

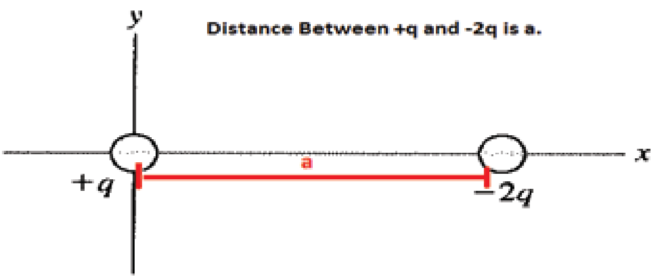
- A: $(1 / 4\pi\varepsilon_0)$ * q/d
- C: $(1 / 4\pi\varepsilon_0)$ * 3q/d
- B: $(1 / 4\pi\varepsilon_0)$ * 2q/d
- D: $(1 / 4\pi\varepsilon_0)$ * 4q/d

12. Find the function of electric potential at point x < 0 for the figure given below. k is constant.



- A: kq (x+a) / x(x-a)
- C: kq (x+a) / x
- B: kq (x+a) / x^2
- D: kq (x+a) / (x-a)

13. What is the funtion of potential difference for x > a for the figure below, k is constant.



- A: Zero
- B: -kq*x / x(x-a)
- C: -kq (x+a) / x(x-a)
- D: -kq (x+a) / (x-a)

14. A capacitor has capacitance 2.5 * 10^{-8} F. If V = 450 how many electrons are passed in charging the capacitor?

- A: 3 * 10^{14}
- B: 4 * 10^{11}
- C: 7 * 10^{13}
- D: None of the above.

15. Find the work done in moving a charged particle of 3 micro columb from infinity to a distance of 0.04m to another charged particle of 5 micro columb?

- A: 1.5 J
- B: 2.6 J
- C: 3.4 J
- D: 4.8 J

16. When two capacitors of same capacitance C are connected in parallel and then in series, the capacitance in these two cases are in ratio of?

- A: 1 : 4
- B: 4 : 1
- C: 1 : 2
- D: 2 : 1

17. A parallel plate capacitor is charged and the charging battery is then disconnected. If the plates of the capacitor are moved farther apart by means of insulating handles?

- A: the charge on the capacitor increases.
- B: the voltage across the plates decreases.
- C: the capacitance increases
- D: the electrostatic energy stored in the capacitor increases.

18. Two identical capacitors each of capacitance 5 μF are charged to potentials 2 kV and 1 kV respectively. Their -ve ends are connected together. When the +ve ends are also connected together, the loss of energy of the system is?

- A: Zero
- B: 0.5 J
- C: 1.25 J
- D: 5 J

19. An alpha particle has twice the charge of a proton. Two protons separated by a distance 'd' exert a force 'F' on each other. What must be the separation between the alpha particles so that they also exert a force 'F' on each other?

- A: 2d
- B: d/2
- C: $\sqrt{2}$ / d
- D: d / $\sqrt{2}$

20. The inward and outward electric flux from a closed surface are 8 × 10^3 and 4 × 10^3 units respectively. Then the net charge inside the closed surface is ?

- A: -8 * 10^3 ε_0
- B: 8 * 10^3 ε_0
- C: 4 * 10^3 ε_0
- D: -4 * 10^3 ε_0

TEST-4

1. **S.I unit of permittivity of free space is?**

   - A: c^2 / N.m^2
   - B: F / m
   - C: N.m^2 / c^2
   - D: Both A and B.

2. **A Capacitor of 2μF is connected with a battery of 12 Volts, the charge stored in the capacitor is?**

   - A: 2 μC
   - B: 6 μC
   - C: 12 μC
   - D: 24 μC

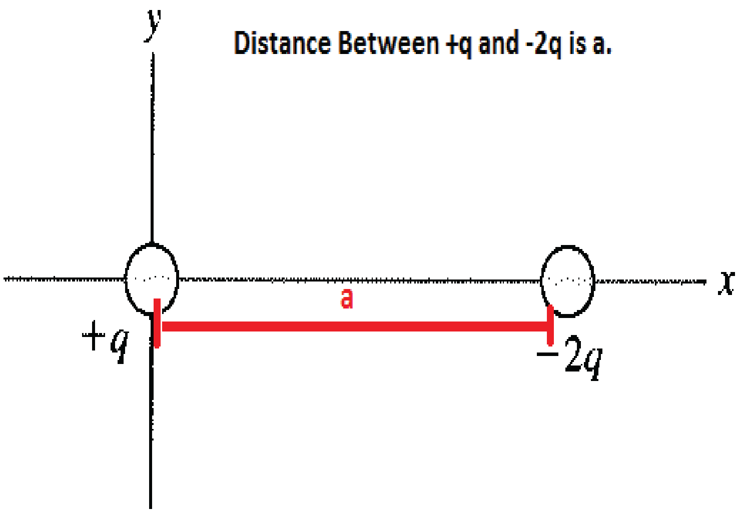
3. **Which of the following statement is true regarding three capacitors each of capacitance C?**

   - A: Total capacitance when connected in parallel is equal to when connected in series.
   - B: Total capacitance when connected in parallel is smaller than when connected in series.
   - C: Total capacitance when connected in parallel is greater than when connected in series.
   - D: Total capacitance when connected in series is zero.

4. **Two charges experience a force of 10 N, when the medium is Air. If the medium is changed to the one whose permittivity is '2' then the force will be?**

   - A: 2 N
   - B: 3 N
   - C: 5 N
   - D: 10 N

5. **For the figure below, what is the function of potential difference for point x such that 0 < x < a. k is constant.**

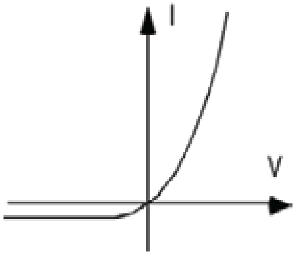


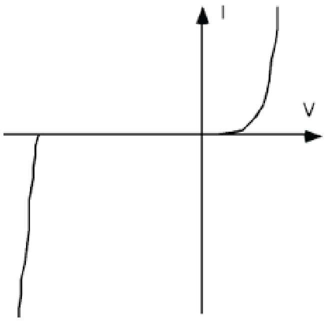
   - A: kq (3x-a) / (x-a)
   - B: kq (3x-a) / x(x-a)
   - C: kq (x-a) / x(x-a)
   - D: kq (3x) / (x-a)

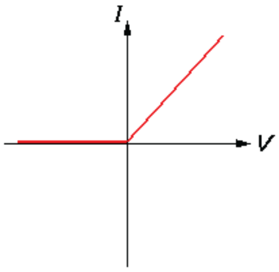
6. **1 eV = ?**

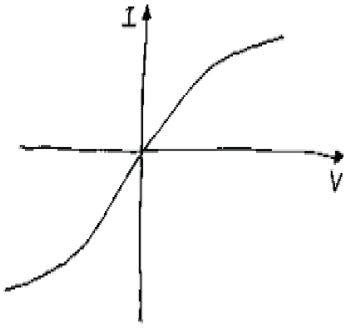
- A: $1.0 * 10^{-19}$ J
- B: $1.6 * 10^{-19}$ J
- C: $3.8 * 10^{-19}$ J
- D: $10 * 10^{-19}$ J

7. **Which of the following is the I-V curve of a junction diode?**

A: 

C: 

B: 

D: 

8. **The work done in moving a charge along an equipotential surface is?**

- A: Depends on the path.
- B: Greater than zero.
- C: Zero.
- D: Negative.

9. **If two capacitors of value C1 and C2 are attaching in parallel their total capacitance is?**

- A: C1 + C2
- B: C1C2 / (C1 + C2)
- C: C1 * C2
- D: (C1 + C2) / C1C2

10. **In RC circuis, smaller values of time constant RC lead to?**

- A: No discharging.
- B: Rapid discharging.
- C: Slower discharging.
- D: Discharging is independend of the RC value.

11. Gauss's law can be applied to?

- A: Plane surface
- B: Curved surface
- C: Closed surface
- D: Any surface.

12. Electric field CAN NOT deflect?

i) alpha rays
ii) beta rays
iii) x rays.

- A: i only.
- B: ii only.
- C: iii only.
- D: ii and iii only.

13. Charge a and b of 1 C and 5 C are place in the electric field at distances 2 m and 5 m respectively. What is the ratio of force exerted on the charges a : b?

- A: 2 : 5
- B: 25 : 4
- C: 5 : 4
- D: 4 : 25

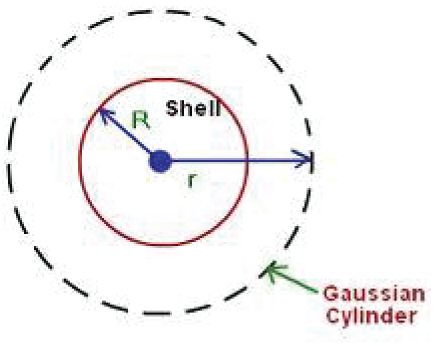
14. Which of the following is a correct relationshiop between work done, charge and voltage?

- A: J = VC
- B: J = V/C
- C: JV = C
- D: $J = VC^2$

15. Unit of electric flux is?

- A: N/C
- B: N^2m/C^2
- C: N^2/Cm
- D: Nm^2/C

16. If the inner shell of radius R is charged with a magnitude X columb. What is the electric flux in Nm^2/C through the Guassian surface given below?



- A: X
- B: X/ε_0
- C: $X\varepsilon_0$
- D: Zero

17. Electric intensity may be defined as?

- A: $-\varepsilon_0 / \Delta r$
- B: $\varepsilon_0 / \Delta r$
- C: $\Delta V/\Delta r$
- D: $-\Delta V/\Delta r$

18. Two point charges 3×10^{-6} C and 8×10^{-6} C repel each other by a force of 6×10^{-3} N. If each of them is given an additional charge $- 6 \times 10^{-6}$ C, the force between them will be?

- A: $2.4 * 10^{-3}$ N (attractive)
- B: $2.4 * 10^{-3}$ N (repulsive)
- C: $1.5 * 10^{-3}$ N (repulsive)
- D: $1.5 * 10^{-3}$ N (attractive)

19. Electric potential at any point is defined as?

- A: Work done in bringing unit negative charge from infinity to that point.
- B:Work done in bringing unit positive charge from a nearby point to that point keeping it in Equilibrium
- C: Work done in bringing unit positive charge from infinity to that point.
- D: Work done in bringing unit positive charge from infinity to that point keeping it in equilibrium.

20. If electric intensity is increased by three times the energy density of the capacitor?

- A: Remains same.
- B: Decrease by 3 times.
- C: Increase by 3 times.
- D: Increase by 9 times.

CURRENT ELECTRICITY

TEST-1

1. Thermo-couples convert which form of energy into electrical energy?

- A: Mechanical energy.
- B: Chemical energy.
- C: Heat energy.
- D: Light.

2. Resistances connected in series: Resistances connected in parallel - have across them?

- A: Same voltage: Same current.
- B: Same current: Same current
- C: Same voltage: Same voltage.
- D: Same current: Same voltage

3. Galvanometer is used to measure?

- A: Voltage
- B: Power
- C: Current
- D: Resistance.

4. Electric generators convert which form of energy into electrical energy?

- A: Mechanical energy.
- B: Chemical energy.
- C: Heat energy.
- D: None of the above.

5. Which of the follwing statement is true?

i. Galvanometer is connected in series.

ii. Voltmeter is connected in parallel.

- A: I only
- B: II only
- C: Both I and II
- D: Neither I nor II.

6. Speed of randomly moving free electrons in a metallic wire depends upon?

- A: Temperature
- B: Cross section area of the metal
- C: Length of metal.
- D: All of the above

7. Resistance of a copper wire is?

- A: Directly proportional to the length of the wire.
- B: Inversely proportional to the cross sectional area of the wire.
- C: Directly proportional to the amount of current in the wire.
- D: Both A & B.

8. Electric charge on an object is measured as 5 micro coulomb. How the value of this charge can be expressed in terms of base units?

- A: 5×10^{-6}ampere second
- B: 5×10^{6}ampere second
- C: 5×10^{-6}coulomb second
- D: 5×10^{6}coulomb second

9. Force on a current carrying conductor is given by :

- A: $ILsin\theta$
- B: ILB
- C: IL
- D: $ILBsin\theta$

10. SI unit of resistivity is?

- A: Ω
- B: Ω / m^2
- C: Ω . m
- D: $\Omega^{-1} . m^{-1}$

11. Which of the following is the difference between the conventional and electric current?

- A: Magnitude
- B: Speed of electric flow
- C: Direction of electric flow
- D: None of the above.

12. As per Ohm's law current *"I"* flowing through a conductor is directly proportional to?

- A: V
- B: Length of conductor
- C: Cross sectional area of conductor.
- D: All of the above.

13. Two resistance of value R and 3R in series are connected to a voltage source V. Voltage drop across the 3R resistance is?

- A: Same as R
- B: Twice to that across R
- C: Three times to that across R
- D: One third to that across R.

14. Kirchhoff's second law is based on law of conservation of?

- A: Charge
- B: Energy
- C: Momentum
- D: Mass

15. Two resistance of value R and 3R in parallel are connected to a voltage source V. Voltage drop across the 3R resistance is?

- A: Same as that across R
- B: Three times to that across R
- C: Nine times to that across R
- D: One third to that across R.

16. Electric current produces which of the following phenomena in the surrounding space?

- A: Increase in heat
- B: Change in chemical nature.
- C: Mangetic field.
- D: None of the above.

17. Which of the following statement is true?

i. Ideal voltmeter has zero resistance.

ii. Ideal galvanometer has infinite resistance.

- A: I only
- B: II only
- C: Both I and II
- D: Neither I nor II.

18. If ΔQ is the charge passing through any cross section of a conductor in time Δt. Then?

- A: $I = \Delta Q * \Delta t$
- B: $I = \Delta Q * \Delta t$ * Area of cross section.
- C: $I = \Delta Q / \Delta t$
- D: $I = \Delta Q / (\Delta t$ * Area of cross section)

19. Electric current can result in which of the following?

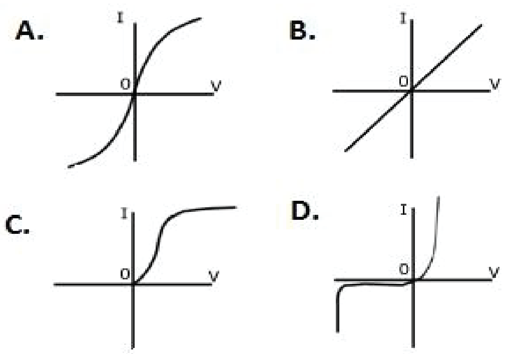
- A: Increase in heat.
- B: Magnetic effect.
- C: Chemical effect.
- D: All of the above.

20. Solar cells convert which form of energy into the electrical energy?

- A: Mechanical energy.
- B: Heat energy.
- C: Chemical energy.
- D: Sunlight energy.

TEST-2

1. **Which of the following graphs shows the I-V relationship for non-ohmic conductors?**



- A: A & D
- C: Only A
- B: Only C
- D: A, C & D.

2. **For resistors, Silver and Gold band indicate the tolerance of ?**

- A: +/- 20 and 10 percent respectively.
- C: +/- 10 and 5 percent respectively.
- B: +/- 5 and 10 percent respectively.
- D: +/- 10 and 20 percent respectively.

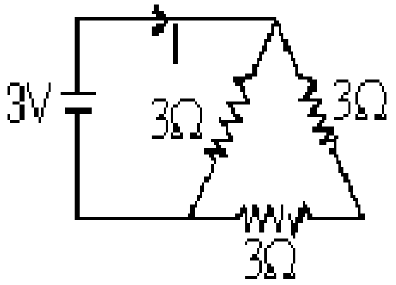
3. **10 V potential differences is applied across the plates of 1 micro-F capacitor. What is the energy stored in capacitor?**

- A: 0.05 mJ
- C: 5 mJ
- B: 0.5 mJ
- D: 50 mJ

4. **If D is the drift velocity of electrons and F is the velocity of free electrons at room temperature due to thermal motion. Which of the following is correct?**

- A: D = F
- C: D < F
- B: D > F
- D: None of the above.

5. **A 3V battery with negligible internal resistance is connected in a circuit as shown in the figure. The current I, in the circuit will be?**



- A: 1 A
- B: 1.5 A
- C: 2 A
- D: 1/3 A

6. One kilowatt hour of electrical energy is the same as?

- A: $36 * 10^5$ Watts
- B: $36 * 10^5$ ergs
- C: $36 * 10^5$ BTU
- D: $36 * 10^5$ Joules.

7. Two resistances of 1 ohm and 2 ohm are connected in series to a 6 V source. What is the power cosumed in the 2 ohm resistor?

- A: 18 W
- B: 8 W
- C: 2 W
- D: 36 W

8. For N resistances each of resistance R attached in series, the total resistance is equal to?

- A: NR
- B: R / N
- C: N / R
- D: R

9. A metallic wire has a resistance of 10 Ω at 0^0 C and 20 Ω at 50^0 C. The temperature coefficient of resistivity for the metal is?

- A: 0.02 K^{-1}
- B: 0.04 K^{-1}
- C: 0.06 K^{-1}
- D: 0.08 K^{-1}

10. A potentiometer has a wire of length 1 m. The specific resistance of the material of the potentiometer wire is 10^{-7} ohm-metre, and the current passing through it is 0.1 ampere, cross-section of the wire is $10^{-6}m^2$. The resistance of the wire is?

- A: 10^{-1} Ω
- B: 10^{-2} Ω
- C: 10^{-3} Ω
- D: 10^{-4} Ω

11. What is the charge stored on a 5 µF capacitor charged to the potential difference of 12 V?

- A: 60 µC
- B: 2.4 C
- C: 2.4 µC
- D: 60 C

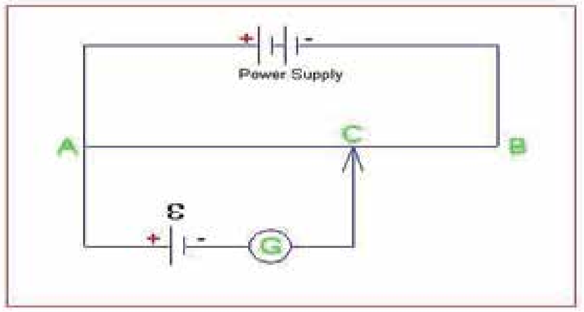
12. The charge on an electron is known to be 1.6×10^{-19} coulomb. In a circuit the current flowing is 1 A. How many electrons will be flowing through the circuit in a second?

- A: 1.6×10^{-19}
- B: 1.6×10^{19}
- C: $0.625 * 10^{12}$
- D: $0.625 * 10^{19}$

13. If $2.0 * 10^{7}$ electrons pass through a conductor in 1 micro second. What is the current flowing through the conductor? Charge of electron is $1.6 * 10^{-19}$ C.

- A: $1.6 * 10^{-6}$ A
- B: $1.6 * 10^{-9}$ A
- C: $3.2 * 10^{-6}$ A
- D: $3.2 * 10^{-9}$ A

14. **In order to measure the resistance of an unknown emf source the reading of galvanometer in the given arrangement must be equal to? Assume that length AB is a resistor of uniform cross sectional area.**



.

- A: Maximum
- B: 10
- C: Negative
- D: Zero.

15. Potentiometer is one of the most accurate methods to measure?

- A: Resistance
- B: Current
- C: Conductance
- D: Voltage

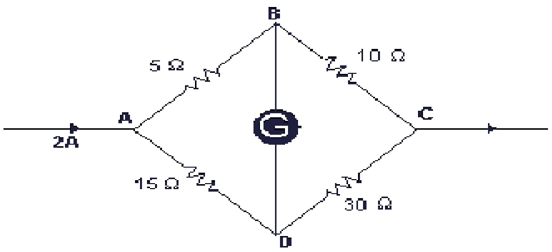
16. A 24 V battery is connected to a 4 ohm resistor, causing a current of 5 amperes. What is the internal resistance of the battery?

- A: 0 Ω
- B: 0.8 Ω
- C: 0.4 Ω
- D: 1.6 Ω

17. An electric rod of 2000 watts rating boils a certain quantity of water in 10 minutes, the heat which is generated for boiling this water is?

- A: $8x10^4$ j
- B: $12x10^5$ j
- C: $19x10^5$ j
- D: $23x10^5$ j

18. For the Wheatstone bridge, shown in the figure, total current is 2A. Then current through BD will be?



- A: 0.5 A
- B: 1.0 A
- C: 0 A
- D: 0.75 A

19. Fractional change in resistance per kelvin is known as?

- A: Resistivity
- B: Conductivity.
- C: Fractional resistance.
- D: Temperature coefficient of resistance.

20. If R_1 and R_2 are the resistances of the filaments of 200 w and 100 w electric bulbs operating at 220 v, what is R_1 / R_2?

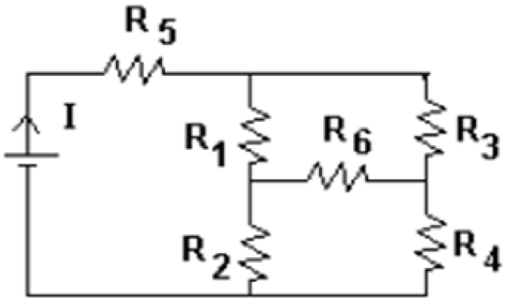
- A: 0.5
- B: 1
- C: 2
- D: 4

TEST-3

1. **If a resister of resistance R is cut into three pieces, then equivalent of resistance of parallel combination will be** :

- A: 0/R
- B: 3/R
- C: R/9
- D: R/3

2. **In the given circuit, it is observed that the current I is independent of the value of the resistance R_6. Then, the resistance values must satisfy?**

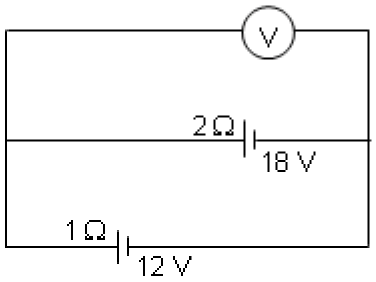


- A: $R_1R_2R_5 = R_3R_4R_6$
- B: $1/R_1 + 1/R_6 = 1 / (R_1 + R_2)$
- C: $R_1R_4 = R_2R_3$
- D: $R_1R_3 = R_2R_4 = R_5R_6$

3. **Two cells of same emf E, but different internal resistances r_1 and r_2 are connected in series to an external resistance R. The value of R for which the potential difference across the first cell is zero, is given by?**

- A: $R = r_1 - r_2$
- B: $R = r_1 + r_2$
- C: $R = r_1 * r_2$
- D: $R = r_1 / r_2$

4. **Two batteries, one of emf 18 V and internal resistance 2 Ω; and the other of emf 12 V and internal resistance 1 Ω, are connected as shown. The voltmeter V will record a reading of?**



- A: 30 V
- B: 6 V
- C: 14 V
- D: 18 V

5. **For two resistance wires joined in parallel, the resultant resistance is 6/5 ohm. When one of the resistance wires breaks, the effective resistance becomes 2 ohm. The resistance of the broken wire is?**

- A: 3/5 Ω
- B: 2 Ω
- C: 6/5 Ω
- D: 3 Ω

6. **What is the value of the resistance with color code Green, Black and Red from left to right?**

- A: 2600 Ohms
- B: 5000 Ohms
- C: 5300 Ohms
- D: 6500 Ohms

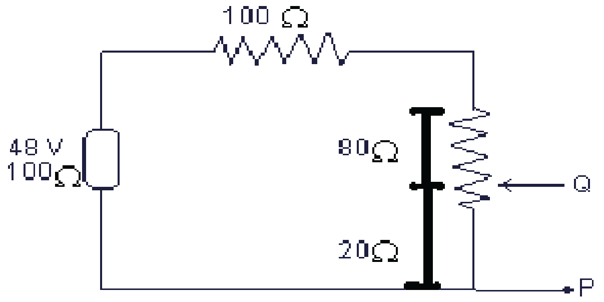
7. **In Pakistan, electricity supplied for domestic use is 220 V, and 110 V in USA. If the resistance of a 60 W bulb for use in Pakistan is R, the resistance of a 60 W bulb for use in USA will be?**

- A: R
- B: 2R
- C: R/4
- D: R/2

8. **If the current flowing in a coil of resistance 90 Ω is to be reduced by 90%, what value of resistance that should be connected in parallel with it is?**

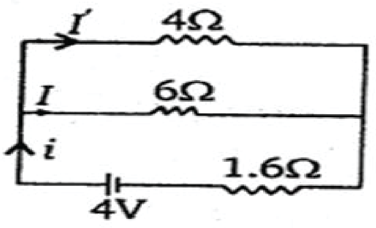
- A: 9 Ω
- B: 90 Ω
- C: 10 Ω
- D: 100 Ω

9. **In the circuit, the potential difference across PQ is?**



- A: 9.6 V
- B: 7.6 V
- C: 4.8 V
- D: 3.2 V

10. **Which of the following statement is true about the circuit given below?**



- A: i = I = I"
- B: i > I" > I
- C: i > I > I"
- D: i = I - I"

11. An electric bulb is rated 220 volt – 100 watt. The power consumed by it when operated on 110 volt will be

- A: 75 W
- B: 40 W
- C: 25 W
- D: 50 W

12. The resistance of a piece of wire is 12 ohms. It is bent in the form of an equilateral triangle. What is the eqiuivalent resistance between any two corners of triangle ?

- A: 1.3 ohm
- B: 2 ohm
- C: 4 ohm
- D: 2.7 ohm

13. For N resistors each of resistance R attached in parallel. Total resistance is?

- A: NR
- B: N / R
- C: R / N
- D: None of the above.

14. The resistance of wire of uniform diameter d and length l is R. The resistance of another wire of the same material, but diameter 2d and length 4l will be?

- A: 2R
- B: R
- C: R/4
- D: R/2

15. An aluminium rod and a copper rod are taken, such that their lengths are the same and their resistances are also the same. The specific resistance of copper is half that of aluminium, but its density is three times that of aluminium. The ratio of the mass of aluminium rod, and that of copper rod will be?

- A: 1/6
- B: 2/3
- C: 1/3
- D: 1/8

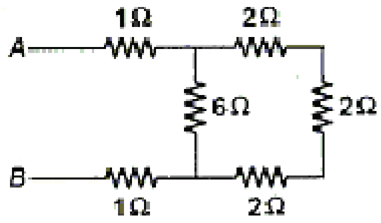
16. A potentiometer has a wire of length 1 m. The specific resistance of the material of the potentiometer wire is 10^{-7} ohm-metre, and the current passing through it is 0.1 ampere, cross-section of the wire is $10^{-6} m^2$. The potential drop per unit length of wire is?

- A: 10^{-8} V / m
- B: 10^{-6} V / m
- C: 10^{-4} V / m
- D: 10^{-2} V / m

17. Which of the following statement is true about the total resistance (R) of two resistors with resistance R1 and R2 attached in parallel?

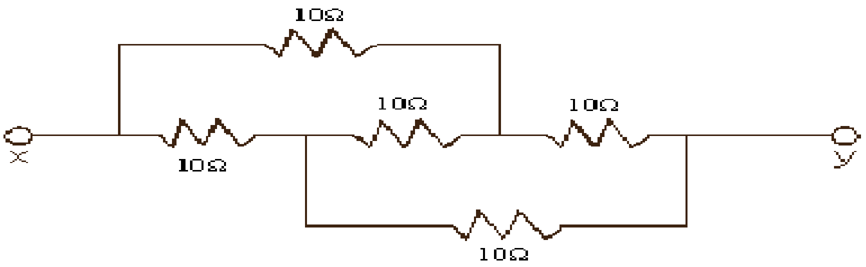
- A: R < R2
- B: R < R1
- C: R = R1 + R2
- D: R < least of R1 and R2.

18. In the figure, what is the equivalent resistance between A and B?



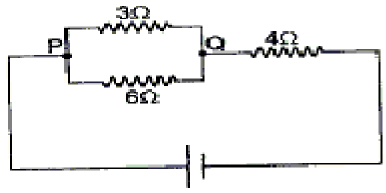
- A: 3 Ω
- B: 4 Ω
- C: 5 Ω
- D: 6 Ω

19. The equivalent resistance between x, and y in the circuit shown is?



- A: 10 Ω
- B: 20 Ω
- C: 50 Ω
- D: 5 Ω

20. If the current through 3 Ω resisters is 0.8 A, the potential drop through 4 Ω resister is?



- A: 1.5 V
- B: 2.6 V
- C: 4.8 V
- D: 9.8 V

TEST-4

1. If resistivity of a conductor is 4 Ωm. Its conductivity is?

- A: 4 $(\Omega m)^{-1}$
- B: 0.125 $(\Omega m)^{-1}$
- C: 0.25 $(\Omega m)^{-1}$
- D: Not enough information given to answer the question.

2. In a Wheatstone's, bridge all the four arms have equal resistance R. If the resistance of the galvanometer arm is also R, the equivalent resistance of the combination as seen by the battery is?

- A: R/2
- B: R/4
- C: 2R
- D: R

3. An ideal galvanometer has?

- A: Infinite resistance.
- B: Zero Resistance.
- C: Resistance equal to that of voltage source.
- D: None of the above.

4. Which of the following is not the same as watt?

- A: Joule / s
- B: A / V
- C: A^2 * Ohm
- D: A. V

5. Two 220 V, 100 W bulbs are connected first in series and then in parallel. Each time the combination is connected to a 220 V AC supply line. The power drawn by the combination in each case respectively will be?

- A: 200 W, 150 W
- B: 50 W, 200 W
- C: 200 W, 50 W
- D: 100 W, 50 W

6. Units of electromotive force are?

- A: Newtons
- B: Joule / Coulomb
- C: Ohms
- D: None of the above.

7. Increase in the temperature for a substance results in?

- A: Increase of resistance.
- B: Decrease of resistance.
- C: Increase or decrease of resistance.
- D: None of the above.

8. Two electric bulbs rated P_1 watt V volts, and P_2 watt V volts are connected in parallel and applied across V volts. The total power will be?

- A: $P_1 + P_2$
- B: $(P_1P_2)^{0.5}$
- C: $(P_1 + P_2) / P_1P_2$
- D: $P_1P_2 / (P_1 + P_2)$

9. Which of the following is a heat sensitive resistor?

- A: Potential Divider.
- B: Variable Resistor.
- C: Thermistor
- D: Rheostat.

10. A charge of 90 C passes through a wire in 1 hour. The current in the wire is?

- A: 90 A
- B: 1.5 A
- C: 25 mA
- D: 2.5 mA

11. Resistance of 1000 ohms with a tolerance of 20 percent may have the actual value in the range of?

- A: 980 and 1020
- B: 800 - 1200
- C: 1000 - 1200
- D: 800 - 1000

12. If 2A current passes through a resistor when connected to a certain battery. If the resistance is replaced by double resistance then current will become:

- A: 2A
- B: 4A
- C: 6A
- D: 1A

13. A good conductor should have?

- A: Low resistivity.
- B: High conductance.
- C: Large number of valence electrons.
- D: All of the above.

14. Resistivity of a wire depends on?

- A: Length
- B: Material
- C: Cross sectional area
- D: All of the above.

15. What will be the reading of Ammeter if connected in series with two volatge sources of 6V and 9V and a resistance of 3ohms?

- A: 1
- B: 5
- C: 10
- D: 15

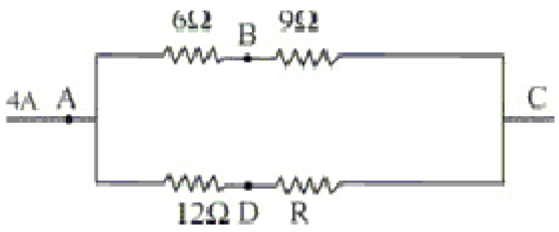
16. When a metallic wire is attached to a battery?

- A: The free electrons start moving randomly.
- B: Valence electrons attain drift velocity in the direction of the voltage source.
- C: Valence electrons start moving towards the direction of the voltage source.
- D: Boith B and C.

17. Over a considerable range of temperature above and below 0^0 C. The change is resistance of a metallic conductor with respect to temperature is?

- A: Linear
- B: Non-Linear
- C: Exponential.
- D: None of the above.

18. If V_B - V_D = 0 in the given circuit, then, what is the value of R?



- A: 3 Ω
- B: 4.5 Ω
- C: 18 Ω
- D: 28 Ω

19. Two electric bulbs rated P_1 watt V volts, and P_2 watt V volts are connected in series and applied across V volts. The total power will be

- A: $P_1 + P_2$
- B: P_1 / P_2
- C: $(P_1 + P_2) / P_1P_2$
- D: $P_1P_2 / (P_1 + P_2)$

20. Two batteries are hooked together in an electric circuit. Which of the following statements is/are true?

l. Maximum voltage is obtained when the batteries are wired in parallel.
II. Maximum voltage is obtained when the batteries are wired in series.
III. Maximum current capacity is obtained when the batteries are wired in parallel.

- A: I only
- B: II only
- C: I and III only.
- D: II and III only.

ELECTROMAGNETISM

TEST-1

1. Magnetic flux passing normally through a unit area is called?

- A: Magnetic induction
- B: Magnetic flux density
- C: Magnetic flux
- D: Both A & B.

2. Which of the following is the proper way to study sinusoidal waveform of voltage?

- A: Voltage is connected to X input and the time base generator is switched off.
- B: Voltage is connected to Y input and the time base generator is switched on.
- C: Voltage is connected to Y input and the time base generator is switched off.
- D: Voltage is connected to X input and the time base generator is switched on.

3. The magnetic induction of solenoid is?

- A: $\mu_0 nI$
- B: $\mu_0 nL$
- C: $\mu_0 n$
- D: None of the above.

4. Magnetic field strength is measured in :

- A: Wb/m^2
- B: Wb/m
- C: Wbm^2
- D: Wb

5. The poles of a magnet are smilar to?

- A: Direction as Geo poles
- B: Opposite to Geo poles
- C: Perpendicular to Geo Poles
- D: None

6. Henry is the unit of?

- A: Electric flux
- B: Magnetic Flux
- C: Inductance
- D: Mangetic field intensity.

7. The waveform of sinusoidal voltage, its frequency and phase can be found by?

- A: CRO
- B: Diode
- C: Transistor
- D: Radio

8. The S.I unit of Magnetic Permiability is ?

- A: wb / m^2
- B: web.A / m
- C: wb.m / A
- D: Wb / (A.m)

9. The relation between Tesla (T) and Gauss (G) is given as ?

- A: $1T = 10^4 G$
- B: $1T = 10^6 G$
- C: $1T = 10^{-4} G$
- D: $1T = 10^{-6} G$

10. Shunt resistor is also called?

- A: By pass resistor
- B: Specific resistor
- C: Reactance.
- D: Ohm resistance.

11. The S. I unit of magnetic permiability is?

- A: TmA^{-2}
- B: TmA^{-1}
- C: Wbm^{-1}
- D: $WbAm^{-1}$

12. One weber is equal to?

- A: $N.A^2/A$
- B: $N.m^2/A$
- C: N.A/m
- D: N.m/A

13. A Moving Charge is surrounded by?

- A: 2 fields
- B: 3 fields
- C: 4 fields
- D: None

14. The origin of Magnetism is?

- A: Iron
- B: Steel
- C: Movement of electron
- D: None of These

15. A current carrying conductor carries current away from you. In this case the direction of magnetic field with respect to you is?

- A: Away from you
- B: Towards you
- C: Clock wise
- D: Anti clockwise

16. Force experienced by a moving charge particle with velocity s and charge e in a magnetic field B is?

- A: F = e / (s x B)
- B: F = e / (s . B)
- C: F = e (s . B)
- D: F = e (s x B)

17. CRO is same as?

- A: Radio
- B: TV Picture tube
- C: Transistor
- D: X-ray machine

18. Ampere's law is applicable to?

- A: Circular path
- B: Rectangular path
- C: To any path
- D: Eleptical path.

19. $F = F_e + F_m$ is ?

- A: Electric force
- B: Magnetic force
- C: Lorentz force
- D: None of the above.

20. The e/m value of electron is?

- A: 1.7588×10^{11}
- B: 1.75599×10^{12}
- C: 1.7588×10^{9}
- D: 1.7559×10^{14}

TEST-2

1. Force acting on an electron (charge q) entering in the magnetic field of B wb/m^2 (along the direction of the field), with velocity v is?

- A: Zero
- B: qvB
- C: 2qvB
- D: -qvB

2. When a small resistance is connected in parallel to the galvanometer it is converted into?

- A: Ammeter
- B: Voltmeter
- C: AVO meter
- D: Ohm meter

3. The restoring couple in the moving coil galvanometer is due to?

- A: Current in the coil
- B: Magnetic field in the coil.
- C: Material of the coil.
- D: Twist produced in suspension wire.

4. The value of a very high resistor R_h connected in series with the galvanometer in order to convert it into voltmeter is given by?

- A: V / (Ig- Rg)
- B: $(V / I_g) - R_g$
- C: $(I_g / V) - R_g$
- D: $I / (V - R_g)$

5. Which of the following is true about the magnetric foce on a beam of electron perpendicular to the direction of the magnetic field?

- A: Force changes the speed of and direction of the electron beam.
- B: Force reduces the number of electrons in the beam.
- C: Magnitude of force is zero.
- D: Force only changes the direction of the electron beam.

6. If the angle between V and B is zero then magnetic force will be?

- A: Max
- B: Min
- C: Zero
- D: None

7. Which of the following is true about a current carrying insulated wire?

It has a surrounding magnetic field.

The magnetic field is circular

Magnetic field lasts as long as there is current in the wire.

- A: i and ii only.
- B: i and iii only.
- C: ii and iii only.
- D: i, ii and iii only.

8. The flux through an area of 1m2 in x -y plane in a magnetic field of 1 T directed along Z- axis will be?

- A: Zero
- C: 0.5 web
- B: 1 web
- D: None

9. If the number of turns of solenoid double but the current in the coil and radius of the coil remains same, then what will be the magnetic flux density produced by the coil?

- A: Magnetic flux density will be haved
- B: Magnetic flux density increases by different amount at different points
- C: Magnetic flux density remains unchanged
- D: Magnetic flux density will be doubled

10. Which of the following is a scalar quantity?

- A: Force
- C: Magnetic Flux
- B: Magnetic Induction.
- D: Both B and C.

11. The voltage that is applied across X-plates in CRO is provided by a circuit called:

- A: Time base generator
- C: Signal generator
- B: Audio generator
- D: Linear generator

12. A photon while passing through a magnetic field is deflected towards?

- A: Norht pole
- C: North or sound depending on their charge.
- B: south Pole
- D: None of the above.

13. A vertical solenoid has 200 turns in a length of 0.4m and carries a current of 3A in anticlockwise.The flux density in the middle in Tesla is about?

- A: $3\pi 10^{-4}$ wb/m^2
- C: $30\pi 10^{-4}$ wb/m^2
- B: $6\pi 10^{-4}$ wb/m^2
- D: $60\pi 10^{-4}$ wb/m^2

14. Which of the following is a hard magnet?

- A: Iron
- B: Nickel
- C: Steel
- D: Copper

15. In multi range Ammeter?

- A: Resistances of different values are connected in series with galvanometer
- B: Different Resistances are connected in parallel with galvanometer
- C: Some resistances are connected in parallel and some of them are connected in series
- D: None of the above.

16. Cathode ray oscilloscope consists of which of the following parts?

- A: Filament, cathode, grid and anode
- B: Cathode, anode, capacitor, screen
- C: Emitter, base, collector, resistor
- D: Resistor, capacitor, inductor

17. The brightness of the spot formed on the screen of CRO in controlled by the?

- A: Cathode
- B: Anode
- C: Y plates
- D: Grid

18. To convert a galvanometer into voltmeter we connect?

- A: A small resistance in parallel.
- B: A large resistance in parallel.
- C: A small resistance in series.
- D: A large resistance in series.

19. The output on CRO screen for the sweep voltage given below would be? Assume T is 1 s.

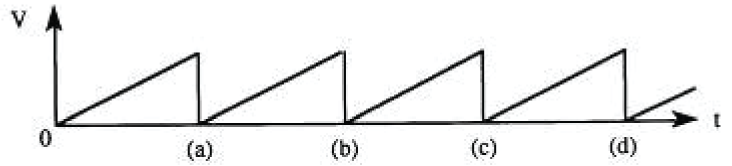


Figure. 2. Voltage difference V between horizontal plates as a function of time t.

- A: A straight line.
- B: A spot deflected linearly along the y-axis.
- C: A spot deflected linearly along the x-axis.
- D: Sinusoidal wave.

20. The potential difference across the shunt resistor R_s is ?

- A: $V = I_g R_g$
- B: $V = (I - I_g) R_s$
- C: $V = (I_g - I) R_s$
- D: Both A & B.

TEST-3

1. **The material used in the fluorescent screen of CRO is?**

- A: Magnesium
- B: Glass
- C: Phosphor
- D: Sodium

2. **A galvanometer with R_g = 15 ohms gives full scale current I_g=20 mA. What is the shunt resistance to convert it into an ammeter of range 10.0 A?**

- A: 0.03 ohms
- B: 0.05 ohms
- C: 0.07 ohms
- D: 0.09 ohms

3. **An electron is travelling along the x-direction. It encounters a magnetic field in the y-direction. Its subsequent motion will be?**

- A: Straight line along x direction.
- B: Circle in xz plane.
- C: Circle in yz plane.
- D: Circle in xy plane.

4. **An electron (q = 1.6 x 10^{-19} C) is moving at right angle to the uniform magnetic field of 3.534 x 10^{-5} T. The time taken by the electron to complete a circular orbit is?**

- A: 4 μs
- B: 3 μs
- C: 2 μs
- D: 1 μs

5. **The diagram below shows?**

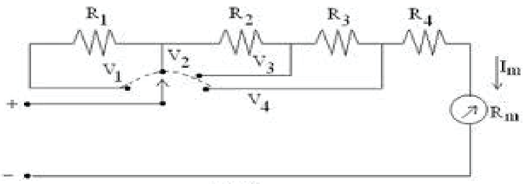
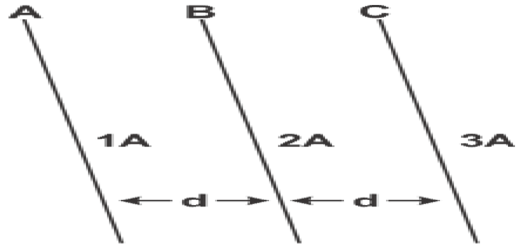


Fig.2

- A: Multi range voltmeter.
- B: Multi range ammeter
- C: Multi range ohm meter.
- D: None of the above.

6. **Three long straight wires A, B and C are carrying currents as shown in the figure. Then, the resultant force on B is directed to?**



- A: Outward from the paper.
- B: Into the paper.
- C: Towards C.
- D: Towards A.

7. **A particle of charge - 16 x 10^{-18} C moving with velocity 10 ms^{-1} along the x-axis enters a region where a magnetic field of induction B is along the y-axis and an electric field of magnitude 10^4 V/m is along the negative z-axis. If the charged particle continues moving along the x-axis, the magnitude of B is?**

- A: 10^3 wb/m^2
- B: 10^5 wb/m^2
- C: 10^{12} wb/m^2
- D: 10^{-3} wb/m^2

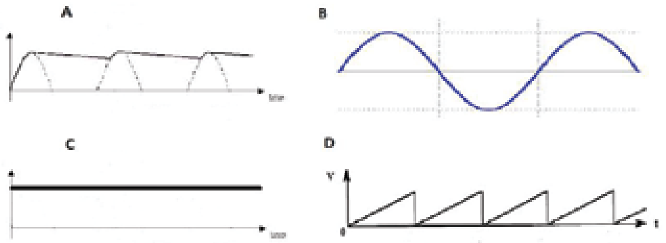
8. **The strength of the magnetic field around a long straight wire carrying current, is?**

- A: The same everywhere around the wire at any distance.
- B: Inversely proportional to the distance from the wire.
- C: Inversely proportional to the square of the distance from the wire.
- D: Directly proportional to the square of the distance from the wire.

9. **How fast a proton should travel in a magnetic field of 2.5 * 10^{-3} T such that magnetic force on it equals its weight? Mass of proton is 1.7 * 10^{-27}**

- A: 4 * 10^{-3} m/s
- B: 4 * 10^{-4} m/s
- C: 4 * 10^{-5} m/s
- D: 4 * 10^{-6} m/s

10. **Wave form of sweep or time base generator of CRO is?**



- A: A
- B: B
- C: C
- D: D

11. **A solenoid is to be designed to give B= 8pi T and maximum current 10 A. What should be the turns per unit length for that solenoid?**

- A: 2 * 10^4
- B: 2 * 10^6
- C: 4 * 10^4
- D: 4 * 10^6

12. **A long solenoid has 200 turns per cm, and carries a current i. The magnetic field at its centre is 6.28 *10^{-2} Weber/m^2. Another long solenoid has 100 turns per cm, and it carries a current i/3. The value of the magnetic field at its centre is?**

- A: 1.05 × 10^{-2} Weber/m^2
- B: 1.05 × 10^{-3} Weber/m^2
- C: 1.05 × 10^{-4} Weber/m^2
- D: 1.05 × 10^{-5} Weber/m^2

13. At the center of a circular coil of radius 5 cm carrying current, magnetic field due to earth is 0.5 x 10^{-5} W/m^2. What should be the current flowing through the coil, so that it annuls Earth's magnetic field?

- A: 40 A
- C: 0.4 A
- B: 4 A
- D: 0.2 A

14. Two similar coils are kept mutually perpendicular, such that their centers coincide at the centre. Find the ratio of the magnetic field due to one coil, and the resultant magnetic field through both coils, if the same current is passed?

- A: 1 : √2
- C: 2 : 1
- B: 1 : 2
- D: √3 : 1

15. To increase the scale of galvanometer to twice of its initial value we need to connect a shunt ?

- A: Rs = Rg
- B: Rs< Rg
- C: Rs>Rg
- D: Rs = 0

16. If two current carrying conductors perpendicular to a magnetic field have similar current is the different direction then?

- A: They attract each other.
- B: They repel each other.
- C: They neither attract nor repel each other.
- D: They may attract or repel each other.

17. Magnetic field on the ground due to a 10 m high wire carrying 400 A current is?

- A: $16\pi * 10^{-7}$ T
- B: $8\pi * 10^{-6}$ T
- C: $8 * 10^{-6}$ T
- D: None of the above.

18. In an ammeter 10% of main current is passing through the galvanometer. If the resistance of the galvanometer is G, the shunt resistance, in ohms is?

- A: 9G
- C: 90G
- B: G/9
- D: None of the above.

19. What is the radius of orbit of an electron moving at $2 * 10^7$ m/s in a uniform magnetic field of $1.2 * 10^{-3}$ T is? Mass of electron is $9 * 10^{-31}$ kg.

- A: $9.5 * 10^{-2}$
- C: $8.4 * 10^{-3}$
- B: $7.8 * 10^{-2}$
- D: $6.9 * 10^{-3}$

20. If mangetic field is at angle 60^0 to the plane. Magnetic flux through the plane is?

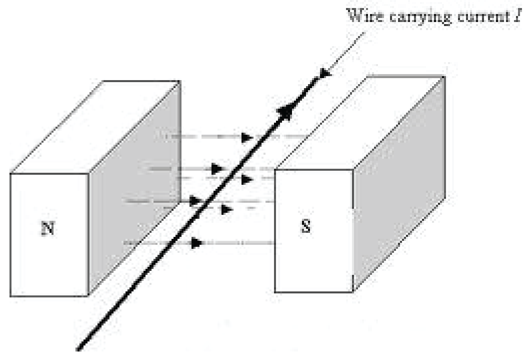
- A: $\Phi_b = BA$
- B: $\Phi_b = BA \cos 30$
- C: $\Phi_b = BA \cos 60$
- D: $\Phi_b = BA \cos 90$

TEST-4

1. A solenoid of length 500m is wounded into 100 turns. A current of 10A flows in it, the magnetic field intensity is ?

- A: 20 μ_0
- B: 200 μ_0
- C: 2000 μ_0
- D: None of the above.

2. What is the direction of force on the wire in the figure below?



- A: Towards North Pole
- B: Towards South Pole
- C: Upwards
- D: Downwards

3. In velocity sector method, the velocity of an electron is given by ?

- A: $v = (2V / m)^{0.5}$
- B: $v = (3\ Ve / m)^{0.5}$
- C: $v = (2V / me)^{0.5}$
- D: $v = (2\ Ve / m)^{0.5}$

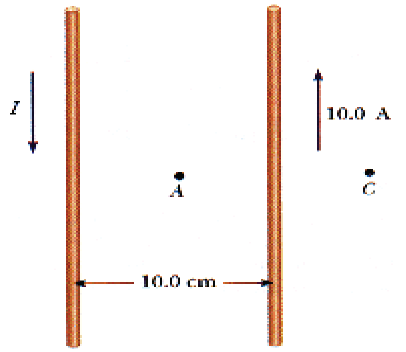
4. 1 weber = ____ ?

- A: 10^6 Maxwell
- B: 10^8 Maxwell
- C: 10^{10} Maxwell
- D: 10^{12} Maxwell

5. A soft iron cylinder is placed inside the galvanometer coil to?

- A: Make magnetic field stronger near the coil.
- B: Make magnetic field radial near the coil.
- C: Increase torque.
- D: All of the above.

6. **Two straight parallel wires held vertically have equal but opposite currents as shown in figure:**



Which of the following effect will be observed?

- A: Magnetic field at A is stronger than that at C
- B: Magnetic field at A is weaker than that at C
- C: Magnetic field at A ,C is same.
- D: Magnetic field at A is may be stronger or weaker than C

7. **If B = 40i + 8k Wb/m^2. How much flux passes through a 5 m^2 xy plane?**

- A: 40 Wb
- B: 200 Wb
- C: 240 Wb
- D: 360 wb

8. **AVO meter is used to measure?**

- A: Current
- B: Voltage
- C: Resistance
- D: All of above

9. **In the galvanometer the current is proportional to ?**

- A: Magnetic field
- B: Electric field
- C: Angle of deflection of suspension wire.
- D: All of the above.

10. **C.R.O has how many sets of deflecting plates?**

- A: One
- B: Two
- C: Three
- D: Four

11. **The force on the charge particle moving parallel to magnetic field is?**

- A: Maximum
- B: Minimum
- C: Zero
- D: None

12. **A current carrying loop, when placed in a magnetic field will experience?**

- A: Electric flux
- B: Torque
- C: Magnetic flux
- D: Unidirectional Force

13. The dot product of magnetic field and area is equal to?

- A: Electric flux
- B: Magnetic flux
- C: Ampere law
- D: Magnetic induction.

14. An ideal voltmeter has?

- A: Small resistance
- B: Medium resistance
- C: High resistance
- D: Zero resistance.

15. What is the magnetic flux passing through a plane parallel to B?

- A: Zero
- B: Minimum
- C: Maximum.
- D: Cannot determine with the given information.

16. If α is the angle between a current carrying wire and magnetic field, force on the conductor is directly proportional to?

- A: α
- B: $\sin \alpha$
- C: $\cos \alpha$
- D: α^2

17. When charge particle enter perpendicular to uniform magnetic field, the path followed by it is?

- A: A helix
- B: A circle
- C: Straight line
- D: Eclipse

18. An electron moves at $2x\ 10^2$ m/sec perpendicular to magnetic field of 2T what is the magnetic of magnetic force?

- A: $1x\ 10^{-6}$ N
- B: 6.4×10^{-17} N
- C: 3.6×10^{-24} N
- D: 4×10^{6} N

19. The unit of permeability of free space is?

- A: T.m/A
- B: $T.m^2/A$
- C: $T.m/A^2$
- D: None

20. When a variable resistance and a cell is attached in series to a galvanometer. It is turned into?

- A: Ammeter
- B: Voltmeter
- C: Ohm meter
- D: AVO meter.

ELECTROMAGNETIC INDUCTION

TEST-1

1. The induced currents always produce expanding magnetic fields around their conductors in a direction that opposes the original magnetic field. This law is called?

- A: Lenz's law
- B: Fleming's law
- C: Ohm's law
- D: Kirchhoff's law

2. The back e.m.f exist in the?

- A: Generator
- B: Motor
- C: Transformer
- D: Diodes

3. The energy stored in the inductor is?

- A: $1/2\ L I^2$
- B: $1/2\ L^2 I$
- C: $1/2\ L^2 I^2$
- D: $1/2\ LI$

4. The induced e.m.f. in A.C generator is with N turn in the coil is?

- A: $\varepsilon = NvBL \sin \Theta$
- B: $\varepsilon = 2NvBL \sin \Theta$
- C: $\varepsilon = 2NBL \sin \Theta$
- D: $\varepsilon = NBL \sin \Theta$

5. Lamination of lamina core of transformer is to decrease its ?

- A: Electric Resistance
- B: Hysteresis
- C: Eddy current
- D: Inductance

6. An inductor is a circuit element that can store energy in the form of ?

- A: Magnetic field
- B: Electric flux
- C: Electric field
- D: Both A & B.

7. A transformer is said to be 100% efficient if ?

- A: Output voltage = Input voltage
- B: Output current = Input current
- C: Output power = Input power
- D: All given conditions must satisfy.

8. In the motional e.m.f the mechanical energy consumed is converted into ?

- A: Heat energy
- B: Internal energy
- C: Steam energy
- D: None of the above.

9. Magnetic compass needle will be deflecting, if it is kept near ?

- A: Static charge
- B: Soft iron
- C: Semi conductor
- D: Accelarating charge

10. The coil in A.C generator rotates with rotational speed of 10 rad/sec its frequency is ?

- A: $2\pi\ s^{-1}$
- B: $5\pi\ s^{-1}$
- C: $10/\pi\ s^{-1}$
- D: $5/\pi\ s^{-1}$

11. Generator converts?

- A: Mechanical energy to electrical energy only in AC generators.
- B: Mechanical energy to electrical energy only in DC generators.
- C: Mechanical energy to electrical energy in both DC and AC generators.
- D: Electrical energy to mechanical energy in both DC and AC generators.

12. The application of mutual induction is a ?

- A: Television
- B: Radio
- C: D.C. motor
- D: Transformer

13. In Pakistan the frequency of A.C is?

- A: 50Hz
- B: 100Hz
- C: 150Hz
- D: 220Hz

14. Lenz's law is consistent with the law of conversation of?

- A: Momentum
- B: Energy
- C: Charge
- D: All of the above.

15. A transformer is a device which step up or stop down?

- A: Energy
- B: Power
- C: Voltage
- D: Resitance.

16. The priciple of transformer is?

- A: Amperes law
- B: Mutual induction
- C: Motional e.m.f.
- D: Electric field variation.

17. Mutual inductance in secondary coil is due to?

- A: Current in the primary coil
- B: Current in the secondary coil
- C: Rate of change of current in secondary coil
- D: Rate of change of current in primary coil

18. The coil arrangement used in the generator is called ?

- A: Commutators
- B: Slip rings
- C: Armature
- D: Split rings

19. The relation of motional e.m.f. is?

- A: $\varepsilon = vBL (\sin \Theta)$
- B: $\varepsilon = - vBL (\sin \Theta)$
- C: $\varepsilon = - qvB (\sin \Theta)$
- D: $\varepsilon = - vBL (\cos \Theta)$

20. One Henry mutual induction is numerically equal to the e.m.f induced in the secondary coil when the rate of change is?

- A: One ampere per second in secondary coil
- B: One ampere per second in primary coil
- C: One unit per second change of magnetic flux in secondary coil.
- D: One unit per second change of magnetic flux in primary coil.

TEST-2

1. In a coil, if current changes from 10 A to 2 A in 0.1 sec, induced emf is 3.28 V. What is self-inductance of coil?

- A: 4 H
- B: 0.4 H
- C: 0.04 H
- D: 0.08 H

2. A transformer changes 12V to 1800V and there are 6000 turns in secondary coil, the no. of turn on primary coil is?

- A: 40
- B: 20
- C: 10
- D: 2

3. What energy is stored in an inductor of 40mH, when a current of 8 A passing through it ?

- A: 260 mJ
- B: 1.3 J
- C: 1.6 mJ
- D: 2.3 J

4. Induced e.m.f is?

- A: Directly propotional to change in magnetic flux
- B: Directly propotional to rate of change of flux
- C: Inversely propotional to change in flux
- D: It is not dependent on magnetic flux

5. A.C and D.C have same?

- A: Effect in charging a capacitor
- B: Effect in charging a battery
- C: Effect while passing through an inductor
- D: Heating effect through a resistor

6. Mechanical energy required to keep the coil of a generator rotating?

- A: Is independent of the speed of the coil.
- B: Increases with the speed of the coil.
- C: Decreases with the speed of the coil.
- D: Depends on the magnets used in the motor.

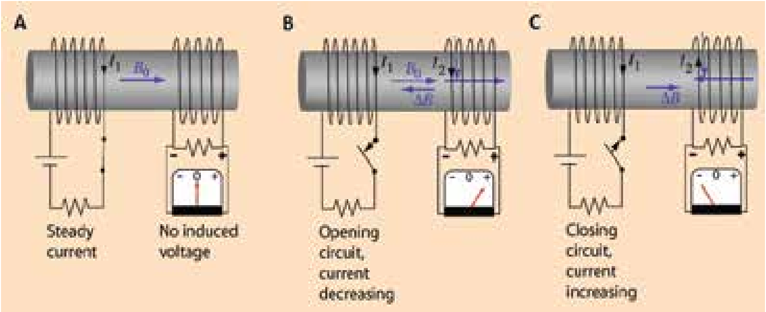
7. A wire with loop of 1000 turns has self inductance of 2H. What is the flux (in Wb) through each turn of the coil when current of 6A is flowing?

- A: $1.2 * 10^{-2}$ Wb.
- B: $2.4 * 10^{-3}$ Wb.
- C: $3.0 * 10^{-4}$ Wb.
- D: Not enough information given.

8. **The eddy current in transformers results in?**

- A: Short circuit in transformers.
- B: Heating of core.
- C: Higher efficiency for step up transformers.
- D: Higher efficiency for step down transformers.

9. **Which of the following arrangement shall have an induced emf?**



- A: A only
- B: C only
- C: B and C only.
- D: All of them

10. **The self inductance is defined as?**

- A: L = (N*I) / Φ
- B: L = Φ / I
- C: L = (NΦ) / I
- D: L = (N*I) / Φ

11. **Core in transformers is laminated with insulation between layers in order to?**

- A: Reduce hysteresis losses.
- B: Reduce risk of shock from the transformer.
- C: Reduce eddy currents.
- D: Increase setp up voltage.

12. **Consider a flat square coil with N = 5 loops. The coil is 20 cm on each side, and has a magnetic field of 0.3 T passing through it. The plane of the coil is perpendicular to the magnetic field. If nothing is changed, what is the induced emf?**

- A: 30 V
- B: 18 V
- C: 1.5 V
- D: Zero V

13. **If rate of change of current is increased by four times. Self induced emf?**

- A: Increase by 2 times.
- B: Decrease by 2 times.
- C: Increase by 4 times.
- D: Remains same.

14. **A 50 mH coil carries a current of 2 A. Then, the energy stored in joule is?**

- A: 0.05 J
- B: 0.08 J
- C: 0.1 J
- D: 5 J

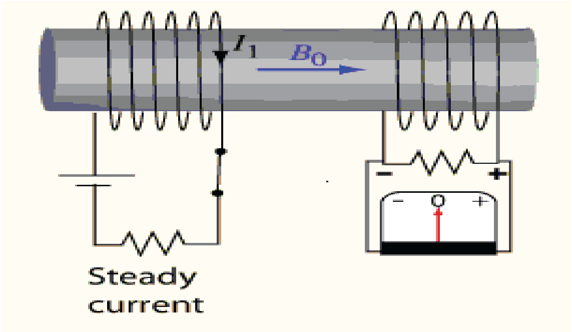
15. Which of the following is the proper way to study the sinusoidal wave form of voltage?

- A: Voltage is connected to 'X' input and time base is switched off
- B: Voltage is connected to 'Y' input and time base is switched off
- C: Voltage is connected to 'X' input and time base is switched on
- D: Voltage is connected to 'Y' input and time base is switched on

16. If a 3cm of wire is moved at right angle to the magnetic field with a speed of 2 m/sec and if flux density is 5 Telsa, what is the magnitude of induced e.m.f ?

- A: - 0.03v
- B: - 0.3v
- C: - 0.6v
- D: - 10v

17. What is the induced emf in the given circuit?



- A: Zero
- B: $-\Phi B_0 I_1$
- C: $-\Phi B_0 / I_1$
- D: We need information about number of turns to answer the question.

18. To minimize the power losses in the transmission lines ?

- A: High current low voltage is used
- B: High voltage low current is used
- C: Due to AC current power loss is zero.
- D: Conductor is made thicker.

19. In mutual induction, the mutual inductance of the two coils depends upon ?

- A: Number of turns
- B: Area of cross section of coil
- C: The distance between the two coils
- D: All of them

20. If a current of 30 A flowing in the primary coil is made zero in 0.1 sec and the emf induced in the secondary coil is 15 volt. What is the mutual inductance between the coils?

- A: 0.05 H
- B: 1.05 H
- C: 0.1 H
- D: 0.2 H

TEST-3

1. **If a rectangular loop passes with velocity v above an infinite region with uniform magnetic flux density Φ and intensity B then the induced emf on the loop is?**

- A: -vB * area of the loop
- B: -vΦ * area of the loop
- C: Infinite
- D: Zero

2. **The back motor effect?**

   Enhances motor efficiency

   Reduced torque of the motor.

   Results in energy losses.

- A: i only
- C: i and ii only
- B: iii only
- D: ii and iii only.

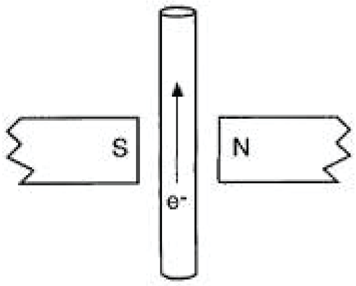
3. **If two inductances are joined in parallel, the equivalent inductance is 2.4 H, and it becomes 10 H, if they are joined in series. Then, the difference between both of them will be?**

- A: 2 H
- C: 5 H
- B: 4 H
- D: 10 H

4. **A transformer has an efficiency of 80%. It is connected to a power input of 5 kW at 200 V. If the secondary voltage is 250 V, the primary and secondary currents respectively are?**

- A: 25 A and 20 A
- C: 25 A and 16 A
- B: 20 A and 16 A
- D: 40 A and 25 A

5. **The diagram shows a wire, carring current 'I', placed between poles of a magnet:**



In which direction does the force on the wire act?

- A: Towards the 'N' pole of the magnet
- B: Outwards
- C: Inwards
- D: Towards the 'S' pole of the magnet

6. An adopter for mobile phones is an example of ?

- A: Step up transformer
- B: Step down transformer
- C: Rectifier
- D: Both B and C.

7. A 50 Hz AC current of maximum value 1 A flows through a primary coil of transformer. If the mutual inductance between the primary and secondary coils is 1.5 H, the maximum value of voltage induced in the secondary coil is?

- A: 75 V
- B: 225 V
- C: 250 V
- D: 300 V

8. A wire moving perpendicular to a magnetic field experiences induced emf V. At what ange would emf would be halved? (keeping all other factors same)

- A: 0^0
- B: 30^0
- C: 45^0
- D: 60^0

9. What is the mutual inductance of two coils if 5.6V is induced in the secondary coil due to change of current from 100A to 20A in 0.02 s in the primary coil?

- A: $1.4 * 10^{-2}$ H
- B: $3.7 * 10^{-3}$ H
- C: $2.8 * 10^{-4}$ H
- D: $1.4 * 10^{-3}$ H

10. A solenoid of area of cross section 2.0 cm^2 and length 100 cm stores energy. When current of 5.0A flowing in it produces B = 0.1T then the stored energy is ?

- A: $10^{-4} / \mu_0$
- B: $10^{-6} \mu_0$
- C: $10^{-6} / \mu_0$
- D: None of the above.

11. A rectangular coil with 20 turns and area of cross-section 25 cm^2 has a resistance of 100 ohms. If a magnetic field, which is perpendicular to the plane of the coil changes at a rate of 1000 tesla/sec, what is the current in the coil?

- A: 10 A
- B: 50 A
- C: 0.5 A
- D: 5 A

12. A loop of wire is placed in a magnetic field of 0.6 T such that B is perpendicular to plane of the loop. If loops beings to shrink at a constant rate of 0.8 m^2/s. Magnitude of emf induced is?

- A: Zero
- B: 0.3 V
- C: 0.5 V
- D: 0.8

13. For a good transformer the hysterisis loop are --------- in size?

- A: Small
- B: Large
- C: Zero
- D: It does not affect efficiency of transformers.

14. What is the self inductance of a coil when a change of current from 0 to 2A in 0.05 sec induces an emf of 40V in it ?

- A: 1H
- B: 2H
- C: 3H
- D: 4H

15. A copper ring is held horizontally and bar magnet is dropped through the ring with its length along the axis of the ring. The acceleration of the following magnet is?

- A: Equal to that due to gravity
- B: Less than that due to gravity
- C: More than that due to gravity
- D: None of the above.

16. Consider a flat square coil with N = 5 loops. The coil is 20 cm on each side, and has a magnetic field of 0.3 T passing through it. The plane of the coil is perpendicular to the magnetic field. The magnetic field is increased uniformly from 0.3 T to 0.8 T in 1.0 seconds. While the change is taking place, what is the induced emf in the coil?

- A: - 0.1 V
- B: - 0.3 V
- C: 0.1 V
- D: 0.3 V

17. In ideal transformer when potential difference is doubled the current is ?

- A: Doubled
- C: Halved
- B: Tripaled
- D: Same

18. If we double the number of turns, area and current through a solenoid. Its self inductance would?

- A: Increase by 2 times
- B: Increase by 4 times
- C: Increase by 8 times
- D: Remain same.

19. A circuit has a self-inductance of 1 Henry and carries a current of 2 A. What is the value of a capacitor connected to the circuit such that it stores the equal amount of energy as the inductor. Assume V = 400 V.

- A: 12.5 μF
- C: 100 μF
- B: 25 μF
- D: 150 Mf

20. Maximum heat is produced in which part of the transformer?

- A: Core
- C: Winding
- B: Oil
- D: Frame

TEST-4

1. **In an ideal transformer which of the following factors are true?**

   - A: Input and output power is same
   - B: Currents are inversely proportional to voltage
   - C: Currents are directly proportional to voltage
   - D: Both A & B.

2. **Induced electric current can be explained by which law ?**

   - A: Gauss's aw
   - B: Faraday's law
   - C: Ohm's law
   - D: Ampere law

3. **If the emf across the conductor of length 1m moving with a uniform speed at right angles to a magnetic field of 0.5T is 2V, the velocity of conductor is ?**

   - A: 1 ms^{-1}
   - B: 2ms^{-1}
   - C: 4ms^{-1}
   - D: 8ms^{-1}

4. **The negative sign with induced e.m.f. is explained by?**

   - A: Faraday's law
   - B: Lenz's law
   - C: Ampere's law
   - D: Right hand rule

5. **An over loaded motor?**

   Draws very high current

   Draws very low current

   Moves at a slow speed

   - A: i only
   - B: ii only
   - C: i and iii only
   - D: ii and iii only

6. **An emf of 0.003V is induced in a wire when it moves at right angles to uniform magnetic field with a speed of 4 m/ sec if the length of the wire in the field is 15cm, what is the flux density in Telsa ?**

   - A: 0.003
   - B: 0.005
   - C: 6
   - D: 12

7. **If the speed of rotation of AC generator is made four times of its initial value, the percentage increase in an induced emf is?**

   - A: 100%
   - B: 400%
   - C: 300%
   - D: None

8. Unit of inductance is?

- A: Coulombs
- B: Amperes
- C: Volt
- D: Henry

9. In the actual transformer, the output is always?

- A: Equal to input
- B: Less than input
- C: More than input
- D: May be less or more than the input

10. Two parallel conducting wires placed closer to each other carry current in the same direction will ?

- A: Attract each other
- B: Repel each other
- C: No effect
- D: May attract or repel each other

11. The induced e.m.f can be increase by increasing?

- A: Strength of magnetic field.
- B: Increasing speed of loop motion
- C: Number of turns in the coil.
- D: All of the above.

12. Which of the following statement is correct?

- A: Motors have no self induction.
- B: Generators have no self induction.
- C: Motor is like a generator in reverse.
- D: DC motor is generally smaller in size than AC motor.

13. Alternating current changes its?

Magnitude

Direction

Frequency

- A: i only
- B: ii only
- C: i and ii only
- D: ii and iii only.

14. The mutual inductance between two coil is ? (p is subscript of primary coil with electric source and s is the secondary coil with no electric source.)

- A: $M = (N_s\Phi_s) / I_s$
- B: $M = (N_p\Phi_s) / I_p$
- C: $M = (N_p\Phi_p) / I_s$
- D: $M = (N_s\Phi_s) / I_p$

15. Current I is flowing through circular loop of area A. It is placed in uniform magnetic field B_0, so that its plane is perpendicular to B_0. The force or torque on loop will be?

- A: IB_0A
- B: $2IB_0A$
- C: 1/2 * IB_0A
- D: Zero.

16. The jerks in simple DC motor are caused due to?

- A: Commutator
- B: Armature
- C: Torques
- D: Hysteresis losses.

17. In AC current, inductors behave like?

- A: Capacitors.
- B: Resistors.
- C: Diodes.
- D: Copper wire.

18. The energy stored in the inductor per unit volume is ?

- A: $B/2\mu_0$
- B: $B^2/2\mu_0$
- C: $B/4\mu_0$
- D: $B^2/4\mu_0$

19. The instantaneous value A.C. voltage is?

- A: $V=V_0 \sin(2\pi ft)$
- B: $V=V_0 \sin(2f t)$
- C: $V=V_0 \sin(2\pi wt)$
- D: $V=V_0 \sin(2\pi t)$

20. When we wire a solenoid around a ferromagnetic core its self inductance?

- A: Remains same.
- B: Decreases.
- C: Increases.
- D: Depends on the nature of the ferromagnetic core

TEST 1

1. The mean value of A.C. over a complete cycle is?

- A: V_0
- B: $2V_0$
- C: Zero
- D: $V_0 \sin(2\pi ft)$

2. By increasing the frequency of A.C through an inductor the reactance will be ?

- A: Increased
- B: Decreased
- C: Remain same
- D: Reduced to zero.

3. In pure resistive A.C. circuit the voltage and current are ?

- A: In phase
- B: Voltage leads the current by $\pi/2$
- C: Current leads the voltage by $\pi/2$
- D: Voltage leads the current by $3\pi/2$

4. What is the self inductance in a coil in which an induced e.m.f of 2V is set up when the current changes at the rate of 4 A/sec ?

- A: 0.5 m H
- B: 0.5 H
- C: 2 H
- D: 8 H

5. An electrical oscillator is a?

- A: Diode circuit
- B: Rectifier circuit
- C: LC circuit
- D: Transformer

6. The process of combining the low frequency signal with high frequency radio wave is called ?

- A: Modulation
- B: Amplification
- C: Rectification
- D: Frequency modulation.

7. Which of the following have frequency dependent resistance?

- A: Capacitor
- B: Inductor
- C: Resistor
- D: Both A & B.

8. Find the impedance of an AC circuit when the current flowing in it is 100mA and 10 volts are applied to the circuit?

- A: 500 ohms
- B: 100 ohms
- C: 25 ohms
- D: 20 ohms

9. The resistance of inductor is?

- A: 1/2πfL
- B: 2ωL
- C: 2πfL
- D: 2ωL

10. The reciprocal of impedance is called?

- A: Conductance
- B: Inductance
- C: Admittance
- D: Capacitance

11. The combine opposition of resistor, capacitor and inductor is called?

- A: Reactance
- B: Resistance
- C: Impedance
- D: Inductance

12. An A.C varies as a function of?

- A: Voltage
- B: Current
- C: Voltage and current
- D: Time

13. The S.I unit of impedance is?

- A: Joule
- B: Weber
- C: Ampere
- D: Ohm

14. The unit used for capacitative reactance is ?

- A: Volt
- B: Ampere
- C: Joule
- D: Ohm

15. During each cycle A.C reaches its peak value?

- A: One time
- B: Two times
- C: Three times
- D: Four times

16. The A.C e.m.f can be represented which kind of wave form?

- A: Sinusoidal
- B: Cosine wave
- C: Tangent wave
- D: Linear

17. If time period of AC wave is 5s its frequency is?

- A: 50 Hz
- B: 25 Hz
- C: 5 Hz
- D: 0.2 Hz

18. The condition of resonance reached when?

- A: $X_C > X_L$
- B: $X_L < X_C$
- C: $X_L = X_C$
- D: $X_L = X_C = 0$.

19. The peak value of sinusoidal voltage in an AC circuit is 50V.The rms value of voltage is roughly equal to ?

- A: 70V
- B: 40V
- C: 35V
- **D: 45V**

20. A cosine wave leads sine wave by?

- A: $\pi / 2$
- B: $3 \pi / 2$
- C: π
- D: None of the above.

TEST 2

1. **If frequency increases the impedance of RC series circuit?**

   - A: Increases.
   - B: Decreases
   - C: Increases at twice the rate of f.
   - D: Decreases at twice the rate of f.

2. **In pure inductive circuit the voltage?**

   - A: Lead the current by 90^0
   - B: Lag the current by 90^0
   - C: Remain same with current
   - D: Lag the current by 180^0

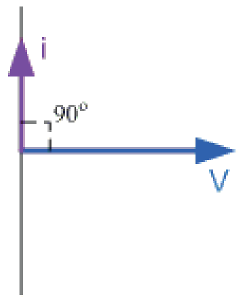
3. **If reactance of 3 ohms and resistance of 4 ohms are connected in series. What is the total impedence?**

   - A: 3 ohms
   - B: 4 ohms
   - C: 5 ohms
   - D: 7 ohms

4. **If AC meter reads 70 V then peak to peak voltage is?**

   - A: 70 V
   - B: 140 V
   - C: 200 V
   - D: 220 V

5. **The phase diagram below is for what kind of load?**



   - A: Inductor
   - B: Capacitor
   - C: Resistor
   - D: Inductor and Capacitor combined.

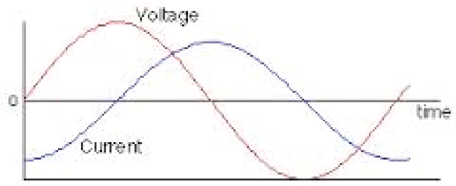
6. **If the frequency of A.C is doubled, the inductor reactance will be ?**

   - A: Half
   - B: Same
   - C: Double
   - D: Triple

7. **If 8 W resistances and 6 W reactance are present in an AC series circuit, what will be the impedance of the circuit?**

- A: 20 ohms
- B: 14 ohms
- C: 10 ohms
- D: 2 ohms

8. **The given wave diagram is for what kind of load?**



- A: Inductor
- B: Capacitor
- C: Resistor
- D: None of the above.

9. **Which of the following is true about electromagnetic waves?**

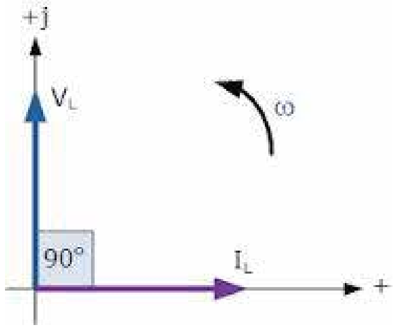
No medium is required for their transmission

They travel in the direction of electric field

They travel in the direction of magnetic field.

- A: i only.
- B: i and ii only
- C: i and iii only
- D: None of of them is true.

10. **The phase diagram below is for what kind of load?**



- A: Capacitor
- B: Resistor
- C: Inductor
- D: None of the above.

11. **An A.C choke is a coil consist of thick copper wire, wound closely over a ?**

- A: Soft iron core
- B: Hard iron core
- C: Soft iron laminated core
- D: Hard iron laminated core

12. If V_0 = 100 V and capacitance of the circuit is 70 ohms. Current as measured by the AC meter is?

- A: 1.0 A
- B: 1.4 A
- C: 2.4 A
- D: Zero.

13. The phase difference between coils of three phase A.C is ?

- A: 60^0
- B: 45^0
- C: 90^0
- D: 120^0

14. Three phase AC motors have how many terminals?

- A: Two
- B: Four
- C: Six
- D: Eight

15. What is phase difference between V and I in series RC circuit if reactance is 50 ohm and resistance is 100 ohm.

- A: Voltage leads current by angle $\tan^{-1}(2)$
- B: Current leads voltage by angle $\tan^{-1}(2)$
- C: Voltage leads current by angle $\tan^{-1}(0.5)$
- D: Current leads voltage by angle $\tan^{-1}(0.5)$

16. The superposition of sound wave on EM waves that causes a change in vertical shape of EM waves is ?

- A: Frequency modulation
- B: Amplitude modulation
- C: Phase modulation.
- D: None of the above.

17. The magnitude of voltage in case of RL series circuit ?

- A: $V = I\sqrt{R^2 + 1/(wL)^2)}$
- B: $V = I(R + \omega L)$
- C: $V = I\sqrt{R^2 + (wL)^2)}$
- D: $V = I\sqrt{R + (wL)}$

18. When A.C flow through RC series circuit the magnitude of voltage is ?

- A: $V = I\ (R^2 + (\omega c)^2)^{1/2}$
- B: $V = I\ (R^2 + 1/(\omega c)^2)^{1/2}$
- C: $V = I\ (R + 1/\omega c)$
- D: $V = I\ (R + \omega c)^{1/2}$

19. In case of capacitor?

- A: I lead V by 90^0
- B: V lead I by 90^0
- C: I lead V by π
- D: V lead I by π

20. Which of the following is true about FM with respect to AM?

- A: It has shorter range.
- B: It has better quality.
- C: It is able to travel around obstacles.
- D: Both A & B.

TEST 3

1. In FM, the frequency of modulated carrier waves has lowest frequency when signal amplitude is?

- A: Maximum negative value
- B: Maximum positive value
- C: Amplitude zero
- D: Both A & B.

2. In an oscillating L-C circuit, the maximum charge on the capacitor is Q. The charge on the capacitor, when energy is stored equally between the electric and magnetic fields is?

- A: Q / 2
- C: Q / √3
- B: Q / √2
- D: Q /

3. In L-R circuit, the value of L is 0.4/π H, and the value of R is 30 ohms. If in the circuit, an alternating emf of 200 V at 50 cycles/s is connected, the impedance of the circuit will be?

- A: 10 ohms
- C: 40 ohms
- B: 30 ohms
- D: 50 ohms

4. A coil takes a current of 2 Ampere and 200 Watt power from an alternating current source of 220 V, 50 Hertz.What is the inductance of the coil?

- A: 0.1 H
- C: 0.3 H
- B: 0.2 H
- D: 0.5 H

5. In case of RLC series circuit the impedance of circuit above resonance frequency is ?

- A: $Z = R + X_c + X_L$
- C: $Z = \sqrt{R^2 + (X_L - X_c)^2}$
- B: $Z = R + X_L - X_c$
- D: $Z = \sqrt{R^2 + (X_L + X_c)^2}$

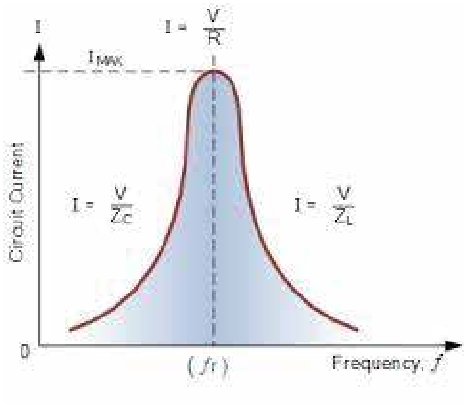
6. In LCR circuit, the capacitance is changed from C to 4C. For the same resonant frequency, the inductance should be?

- A: L/4
- C: 5L
- B: L/3
- D: 2L

7. In an LCR series circuit, the potential difference between the terminals of inductance is 60 V, between the terminals of the capacitor is 30 V, and that across the resistance is 40 V. Then, supply voltage will be equal to?

- A: 10 V
- B: 50 V
- D: 130 V
- C: 70 V

8. **The Current-Frequency graph below is for what kind of circuit?**



- A: Series RLC circuit.
- B: Parallel RLC circuit
- C: RC circuit in series
- D: RL circuit in parallel

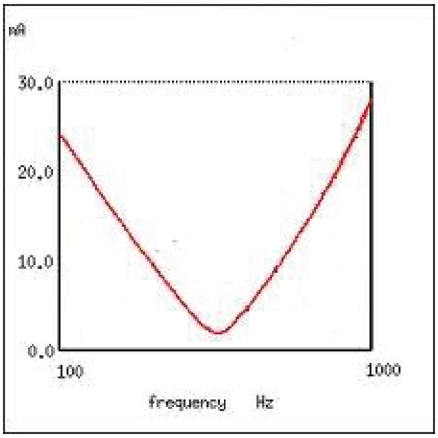
9. **At high frequencies RLC circuits behave like?**

- A: RC circuits
- B: RL curcuits
- C: Resistive circuits
- D: Resonating circuit

10. **In an AC circuit, the voltage applied is $E = E_0 \sin \omega t$. The resulting current in the circuit is $I = I_0 \sin (\omega t - \pi/2)$. The power consumption in the circuit is given by?**

- A: $P = E_0 I_0$
- B: $P = E_0 I_0 / 2$
- C: $P = E_0 I_0 * \sqrt{2}$
- D: Zero.

11. **The Current Frequency graph below is for what kind of circuit?**

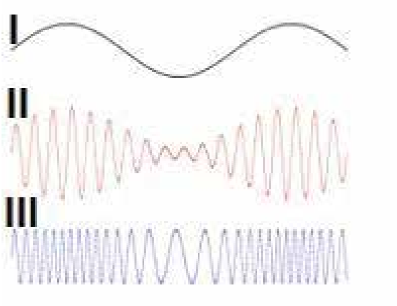


- A: RC series circuit
- B: RL parallel circuit
- C: RLC series circuit
- D: RLC parallel circuit.

12. **A steady current of 20 A flows through a coil of inductance 0.03 henry when connected to a 200 volt D.C supply.What is the value of power facor for 50 Hz AC?**

- A: 0.2
- B: 0.5
- C: 0.6
- D: 0.7

13. Which statement is true about the modulation signals shown below?



- A: I is carrier wave, II is frequency modulated signal and III is amplitude modulated signal.
- B: I is input signal, II is frequency modulated signal and III is amplitude modulated signal.
- C: I is input signal, II is amplitude modulated signal and III is frequency modulated signal.
- D: I is carrier wave, II is amplitude modulated signal and III is frequency modulated signal.

14. In a series RC circuit as the frequency increases, the phase difference between I and V?

- A: Increases
- B: Decreases
- C: Remains same
- D: First increase then decrease.

15. In an LR circuit of 3 mH inductance and 4W resistance, e.m.f. E = 4 cos 1000 t volt is applied. The current amplitude is?

- A: 0.8 A
- B: 4/7 A
- C: 1 A
- D: $4 / \sqrt{7}$

16. In three phases AC, Voltage difference between any two terminals of the three phases is?

- A: 0 V
- B: 120 V
- C: 230 V
- D: 400 V

17. Which of the following is true about the parallel RLC circuit at resonating frequency?

Impedence of the circuit is maximum and equal to R.

Current is minimum.

Current through inductor and capacitor may each be much larger than the source current.

- A: i only
- B: ii only
- C: i and ii only
- D: i, ii and iii.

18. If resistance of 100 ohms, inductance of 0.5 Henry and capacitance of 10×10^{-6} F are connected in series through 50 hertz AC supply, the impedance will be?

- A: 1.87 Ohms
- B: 18.7 Ohms
- C: 190 Ohms
- D: 283 Ohms

19. In RLC series AC circuit, when $X_L = X_C$ then impedance is ?

- A: Minimum
- B: Maximum
- C: Zero
- D: Depends on the circuit arrangement.

20. When a DC voltage of 200 V is applied to a coil of self-inductance ($2\sqrt{3} / \pi$) H, a current of 1 A flows through it. But by replacing DC source with AC source of 200 V, the current in the coil is reduced to 0.5 A. Then, the frequency of AC supply is?

- A: 100 Hz
- B: 75 Hz
- C: 60 Hz
- D: 50 Hz

TEST 4

1. The average power in case of A.C. series circuit is?

- A: P =VI
- B: P = VI cos Θ
- C: P = VI sin Θ
- D: $P = I^2R$

2. The r.m.s value of A.C. current is ?

- A: 0
- B: 0.7 I_0
- C: 0.8 I_0
- D: 0.9 I_0

3. In an inductor the phase difference between the current and voltage is ?

- A: Current lags voltage by 90^0
- B: Voltage lags current by 180^0
- C: Current leads voltage by 90^0
- D: Current lags voltage by 3π/2

4. The average power dissipated in a pure inductor is ?

- A: More than a pure capacitor.
- B: Less than a pure capacitor.
- C: Zero
- D: Depends on the frequency of the voltage.

5. The angular frequency of resonance circuit is ?

- A: $\omega = 1 / LC$
- B: $\omega = 1 / (LC)^{1/2}$
- C: $\omega = LC$
- D: $\omega = (LC)^{1/2}$

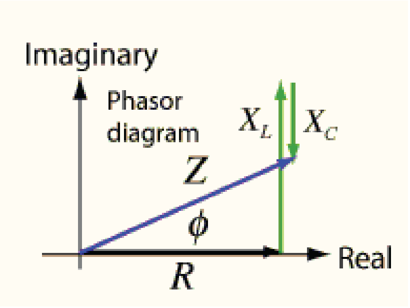
6. In equation P = VI cos Θ; the factor cos Θ is called?

- A: Phase angle
- B: Phase shift
- C: Power factor
- D: None of the above.

7. If the frequency of A.C is large the reactance of capacitor is ?

- A: Large
- B: Small
- C: Zero
- D: Reactance is independent of frequency.

8. **The phasor diagram given below is for what type of circuits?**



- A: RC series circuit
- B: RL series circuit
- C: LC series circuit
- D: RLC series circuit

9. **Phase of AC current wave at negative peak is?**

- A: 0
- B: π / 2
- C: π
- D: 3π / 2

10. **An A.C voltmeter reads 250 volts, its peak voltage is ?**

- A: 120 V
- B: 250 V
- C: 353 V
- D: 500 V

11. **Which of the following is true about the series RLC circuit at resonating frequency?**

Impedance of the circuit is minimum and equal to R.

Current is maximum.

Voltage drop across inductor and voltage drop across capacitor may be much larger than the source voltage.

- A: i only
- B: ii only
- C: i and ii only
- D: i, ii and iii.

12. **A DC battery can pass current continuously through?**

Resistor

Capacitor

Inductor

- A: i only
- B: i and ii only
- C: i and iii only
- D: i, ii and iii.

13. The electrical oscillators are used in?

- A: Metal detectors
- B: Amplifier
- C: Diode
- D: Logic gates.

14. If an alternating voltage is represented as E = 141 sin (628t), then R.M.S value of the voltage and the frequency respectively are?

- A: 141 V, 628 Hz
- B: 100 V, 50 Hz
- C: 100 V, 100 Hz
- D: 141 V, 100 Hz

15. For the reception of electromagnetic wave we use a variable?

- A: Resistor
- B: Capacitor
- C: Inductor
- D: None

16. At resonance frequency the power factor is?

- A: Zero
- B: One
- C: Two
- D: Three

17. Which of the following are electromagnetic waves?

- A: Infra-red waves
- B: Visible spectrum
- C: Micro waves
- D: All of them.

18. In case of phase diagram the vector rotates?

- A: Clockwise
- B: Anti clockwise
- C: Remain stationary
- D: May rotate both ways.

19. F.M stands for?

- A: Frequency modulation
- B: Frequency metal
- C: Frequency member
- D: Frequency measurement

20. An A.C choke has?

- A: High inductance
- B: Small Resistance
- C: Extremely small power dissimation.
- D: All of the above.

PHYSICS OF SOLIDS

TEST-1

1. **Lead and copper are?**
   - A: Brittle substances
   - B: Plastic substances.
   - C: Polymers
   - D: Ductile substances.

2. **If by applying force of 100 N the length of wire is increased by 0.05 m. What is the energy stored in the wire?**
   - A: 5 J
   - B: 2.5 J
   - C: 2000 J
   - D: 1000 J

3. **The magnetic field of orbits and spin axes of electron add to zero in?**
   - A: Ferromagnetic substances.
   - B: Paramagnetic substances.
   - C: Diamagnetic substances.
   - D: None of the above.

4. **Ability of a body to return to its original shape is known as?**
   - A: Stress
   - B: Strain
   - C: Elasticity
   - D: Modulus

5. **A 1 m long steel wire is stretched by 20 cm when subject to a stretching force. What is the strain on the wire?**
   - A: 0.2
   - B: 2
   - C: 20
   - D: 200

6. **The ratio of tensile stress to tensil strain is called?**
   - A: Modulus of elasticity
   - B: Bulk Modulus
   - C: Shear Modulus
   - D: Young's Modulus

7. **Transition from solid to liquid is abrupt in what kind of solids?**
   - A: Amorphous solids
   - B: Polymeric solids
   - C: Crystalline solids
   - D: Glassy solids

8. **Which of the following is the formula for tensile strain?**
   - A: $\tan \Theta$
   - B: $\Delta A / A$
   - C: $\Delta V / V$
   - D: $\Delta L / L$

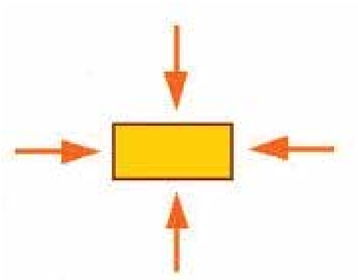
9. The measure of the deformation in a solid when a stress is applied to it is called?

- A: Young's modulus
- B: Elastic constant.
- C: Strain
- D: Elasticity.

10. Shear stress chages ____________ of the object?

- A: Length
- B: Shape
- C: Volume
- D: None of the above.

11. The force depicted by arrows in the given figure may result in?



- A: Volumetric strain.
- B: Tensile strain.
- C: Shear strain.
- D: None of the above.

12. Solids with constant regular patters are known as?

- A: Glassy solids
- B: Crystalline solids
- C: Amorphouse solids.
- D: Polymeric solids.

13. Which of the following graph represents Young's Modulus in a Stress, Strain graph?

- A: Area under graph
- B: Gradient of graph
- C: Reciprocal of gradient of graph
- D: Product of gradient and area of curve

14. Which of the following statement is true?

Crystalline solids have definite melting point

Glassy solids do not have a definite melting point

Polymers have poor crystalline structure.

- A: I and III only.
- C: II and III only.
- B: I & II only
- D: I, II and III.

15. Which of the following is a measure of shear strain?

- A: tan Θ
- C: ΔL / L
- B: ΔV / V
- D: None of the above.

16. Which of the following is a polymeric solid?

- A: Zinc
- C: Glass
- B: Plastic
- D: NaCl

17. Which of the following is the statement of Hooke's law?

- A: Stress is directly proportional to force per unit area.
- B: Strain is a direct impact of stress in the plastic region of the stress-strain curve.
- C: Strain is directly proportional to stress within the proportional limit of the stress-strain curve.
- D: Strain is directly proportional to stress in the within the elastic limit of the stress-strain curve.

18. Semi conductor in pure form is called?

- A: Extrinsic semi conductors.
- B: Doped semi conductors
- C: P and N type semi conductors.
- D: Intrinsic semi-conductors.

19. Substances that undergo plastic deformation until they break are called?

- A: Brittle
- B: Ductile
- C: Elastic
- D: Inelastic

20. Which of the following have same SI units?

Stress

Pressure

Modulus of elasticity

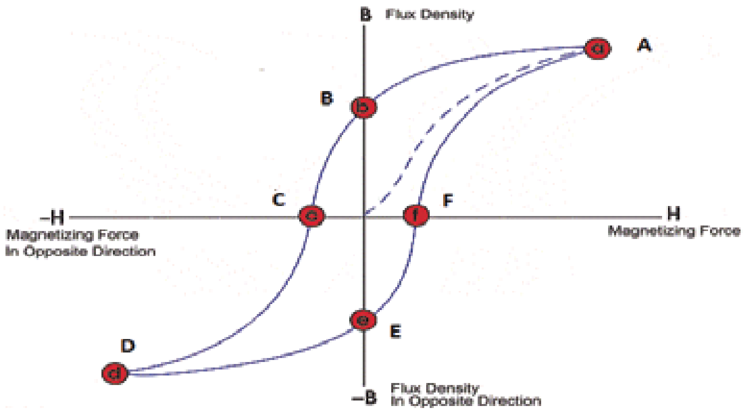
- A: I and II
- C: II and III
- B: I and III
- D: I, II and III.

TEST-2

1. **Which of the following statement is the most appropriate about super conductor's special conducting property?**

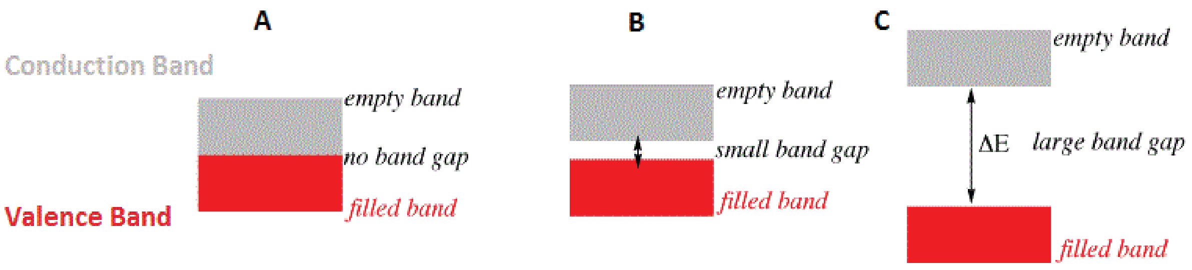
   - A: Zero resistance below critical temperature.
   - B: Zero resistance above critical temperature.
   - C: Zero resistance at 0 K (Absolute zero)
   - D: Zero resistance at room temperature.

2. **What are the magnetic saturation points in the figure below?**



   - A: B and E
   - C: C and F
   - B: A and D
   - D: A only.

3. **As per energy band theory. Which of the following is a conductor?**



   - A: A
   - C: C
   - B: B
   - D: A and B

4. **Which statement is correct?**

   - A: Elasticity is that property of a body which enables a body to regains its original dimension
   - B: Elasticity is that property of a body that does not allow to return its original shape
   - C: Elasticity is that property of a body that does allow to return its original shape and dimension after stress is removed
   - D: Elasticity is that property of a body that does not obeys hook's law

5. Which of the following is the characteristic of semi-conductors?

Partially filled conduction band

A full valence band

Narrow gap between conduction and valence band

- A: I only
- B: II only
- C: I and III
- D: I and II

6. P type semiconductor is formed by doping intrinsic semiconductor with?

- A: Mono-divalent impurity
- B: Bi-valent impurity
- C: Tri-valent impurity
- D: Penta-valent impurity

7. The orbits and spin axes of electrons support each other's magnetic field to create a strong magnetic effect in?

- A: Ferromagnetic substances.
- B: Diamagnetic substances.
- C: Paramagnetic substances.
- D: None of the above.

8. Silicon is perfect insulator at?

- A: Room temperature
- B: 100 K
- C: 0 K
- D: Si is a semi-conductor and does not behave as insulator at any temperature.

9. Bulk modulus is defined as?

- A: Ratio of volumetric stress to strain.
- B: Ratio of tensile stress to strain.
- C: Ratio of shear stress to strain.
- D: Ratio of compressive stress to strain.

10. The orbits and spin axes of electrons support each other's magnetic field to create a weak magnetic effect in?

- A: Ferromagnetic substances.
- B: Paramagnetic substances
- C: Diamagnetic substances.
- D: None of the above.

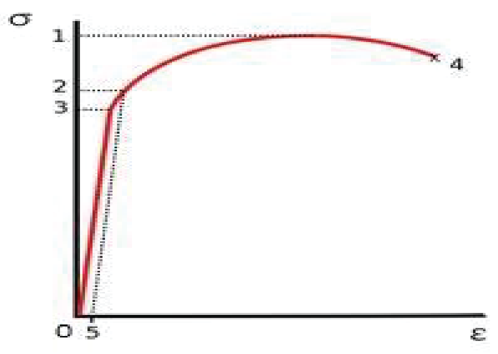
11. If current carried by holes in a semiconductor is 15 mA and current carried by electrons is 5 mA. What is the total current flowing in the semiconductor?

- A: 15 mA
- B: 5 mA
- C: 20 mA
- D: 10 mA

12. A wire fixed at the upper end stretches by length L by applying a force F. The work done in stretching is?

- A: F * L
- B: 2 F * L
- C: F / 2L
- D: 0.5 * F * L

13. Proportional limit of the stress-strain curve given below is?



- A: 1
- B: 2
- C: 3
- D: 4

14. In stress–strain curve, the area up to the elastic limit stress indicates which mechanical property?

- A: Ductility
- B: Strength
- C: Resiliance
- D: Strain

15. If stress on a material is reduced by 4 times, the strain is?

- A: Increased by 4 times.
- B: Increased by 2 times.
- C: Reduced by 4 times.
- D: Depends on the Young's modulus of the material.

16. As temperature of a substance increases, the Young's modulus?

- A: Remains constant.
- B: Increases
- C: Decreases.
- D: May increase or decrease.

17. A stress that changes length of the object is called?

- A: Shear stress
- B: Volume stress
- C: Tensile stress
- D: Length stress.

18. The modulus of elasticity is dimensionally equivalent to?

- A: Strain
- B: Surface tension
- C: Stress
- D: Coefficient of viscosity.

19. A 4.0m long wire is subjected to stretching force and its length increases by 40cm. The percent of elongation which the wire undergoes is:

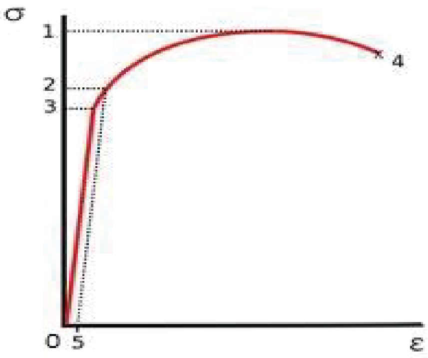
- A: 0.10%
- B: 40%
- C: 10%
- D: 20%

20. N type semiconductor is formed by?

- A: Doping a semiconductor with mono-valent impurity.
- B: Doping a semiconductor with bi-valent impurity.
- C: Doping a semiconductor with trivalent impurity.
- D: Doping a semiconductor with penta-valent impurity.

TEST-3

1. **Which point represents the ultimate tensile strength of the material in the stress-strain curve given below?**

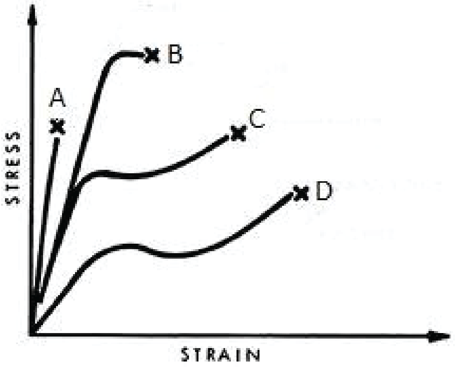


- A: 1
- B: 2
- C: 3
- D: 4

2. **An aluminum wire ($Y = 7 \times 10^{10}$ N/m^2) of diameter 3 mm supports a 40 kg mass. In order to have the same elongation in a copper wire ($Y = 12 \times 10^{10}$ N/m^2) of the same length under the same weight, the diameter should be in mm? Hint: $(7/12)^{0.5} = 0.75$**

- A: 1.80
- B: 2.1
- C: 2.3
- D: 3.8

3. **In the stress-strain curves given below, which material is the strongest?**



- A: A
- B: B
- C: C
- D: D

4. A spherical ball of volume 1,000 cm^3 is subjected to a hydrostatic pressure of 90 N/mm^2, and bulk modulus of the material is 180 kN/mm^2 What is the change in volume of the ball?

- A: 0.005 mm^3
- B: 0.05 mm^3
- C: 50 mm^3
- D: 500 mm^3

5. A steel wire of length 1 meter with cross sectional area 0.02 * $10^{-4}m^2$ is applied a force of 100N. Find the energy stored in the wire if Young's modulus is 5 * 10^{11}?

- A: 5 * 10^{-3} J
- B: 10 * 10^{-3} J
- C: 50 * 10^{-3} J
- D: 100 * 10^{-3} J

6. If a steel cable holding a cable car has a stress of x KPa. If four more cables are attached to the car, the stress on each cable is?

- A: x
- B: x/4
- C: x/5
- D: Depends on the Young's modulus of the material

7. Area of the hysteresis loop measures?

- A: Amount of current required to magnetize a ferromagnetic material.
- B: Amount of current required to magnetize a paramagnetic material.
- C: Energy needed to mangetize and demangetize during each cycle of magnetic current.
- D: Current needed to mangetize and demangetize during each cycle of magnetic current.

8. A wire of cross sectional area 0.01 m^2 has young's modulus of 1500 Pa. What force would cause a strain of 5 in that wire?

- A: 40 N
- B: 60 N
- C: 75 N
- D: 100 N

9. A rubber cord of cross-sectional area 2cm^2 has a length of 1m. when a tensile force of 10N is applied, the length of the cord increases by 1cm. what is the young’s modules of rubber?

- A: 2 x 10^8 Nm^{-2}
- B: 5 x 10^6 Nm^{-2}
- C: 0.5 x 10^{-6} Nm^{-2}
- D: 0.2x10^{-6} Nm^{-2}

10. Below is the Young's modulus for three materials at stress of 10 Kpa? Which one would have highest change in length for a given stress?

A	B	C
70	25	100

- A: A
- B: B
- C: C
- D: Cannot determine from the given information

11. Permanent magnets have?

High retentively

Large coercive force

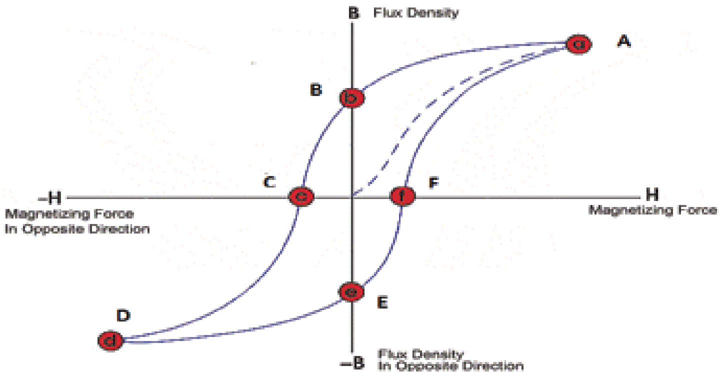
Large area of hysteresis loop.

- A: I only
- B: I and III only
- C: II and III only
- D: I, II and III only.

12. A certain stress applied to elastic materials produces a certain strain in it. If the elastic limit is not exceeded, the energy gained per unit volume of the material is given by?

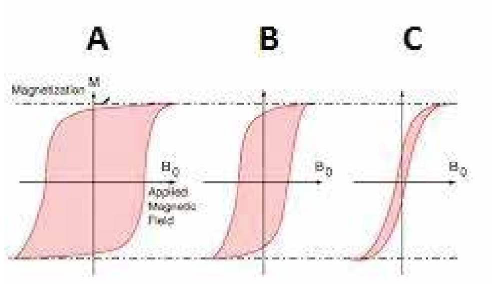
- A: Stress * Strain
- B: Stress / Strain
- C: 1/2 * Stress * Strain
- D: None of the above.

13. Which point shows the magnitude of coercive current in the following hysteresis curve?



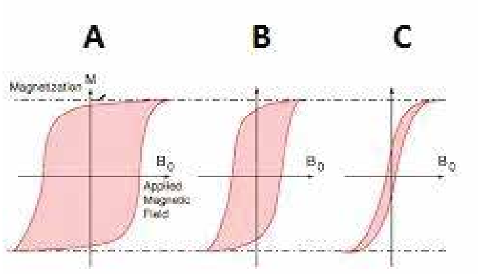
- A: B and E
- B: A and D
- C: C and F
- D: None of the above.

14. Which of the following is most likely to be the hysteresis curve for a permanent magnet?



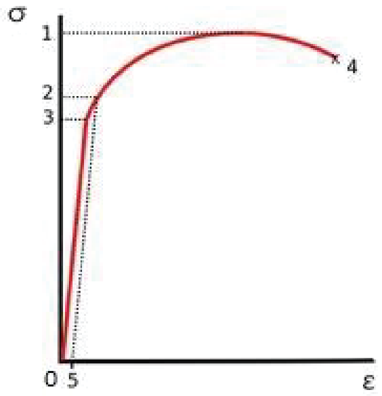
- A: A
- B: B
- C: C
- D: None of the above.

15. Which of the following should be the hysteresis loop of the magnetic core of mortor?



- A: A
- B: B
- C: C
- D: Mortor core is not magnetized.

16. The material in the stress strain curve given below is elastic in the region?

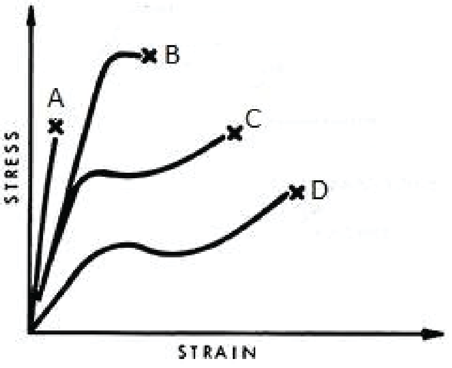


- A: 0-3
- B: 0-2
- C: 0-1
- D: 2-1

17. Two wires of the same material have diameters in the ratio 2 : 1 and lengths in the ratio 1 : 2. If they are stretched by the same force, their elongations will be in the ratio?

- A: 8 : 1
- B: 1 : 8
- C: 1 : 4
- D: 4 : 1

18. The figure below shows the stress-strain curve for four materials. Which one is of them is brittle?



- A: A
- B: B
- C: C
- D: D

19. A wire of cross section A and length l is subjected to load L . A second wire of the same material with an area 2A and length 2l is subjected to the same load L. If extension for first wire is X and for second wire it is Y fing the ratio X/Y?

- A: 1/4
- B: 1/2
- C: 1/1
- D: 2/1

20. Sodium chloride, NaCl usually crystallizes in a face centered cubic lattice. How many ions are in contact with any single Na^+ ion?

- A: 8
- B: 6
- C: 4
- D: 2

TEST-4

1. The stress-strain graph, deduced the following limits reach successively:

- A: Proportional limit, elastic limit, yield limit
- B: Proportional limit, yield limit, elastic limit
- C: Yield limit, proportional limit, elastic limit
- D: Elastic limit, proportional limit, yield limit

2. A stress on a solid may change its?

Length

Volume

Shape

- A: I only
- B: I and III only
- C: III only
- D: I, II and III.

3. A wooden log of mass 10Kg is suspended by attaching it to a steel wire of radius 3 mm. What is the stress on the wire?

- A: 0.35 KPa
- B: 3.5 KPa
- C: 0.35 MPa
- D: 3.5 MPa

4. Two wires of same length and same material but radii in the ratio 1 : 2 are stretched by unequal forces to produce equal elongation. What is the ratio of two forces?

- A: 1 : 4
- B: 1 : 2
- C: 2 : 1
- D: 4 : 3

5. If tensile strain on a piece of wire is 0.075. Percentage elongation is?

- A: 0.075 %
- B: 0.75 %
- C: 7.5 %
- D: Not enough information given to solve the question.

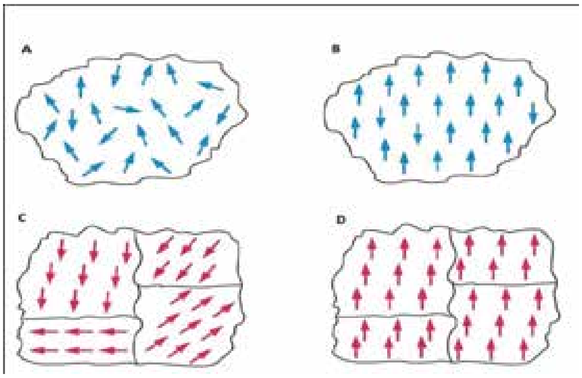
6. **Valence and conduction band over lap for?**

A: Conductors
B: Insulators
C: Semi-conductors
D: None of the above.

7. **In cubic crystals all sides meet at?**

A: 30 Degrees
C: 90 Degrees
B: 60 Degrees
D: 120 Degrees

8. **Which of the following shows the domains in the presence of a magnetic field?**

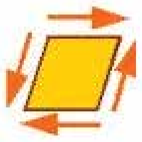


A: B, C and D
B: D only.
C: B only
D: B and D.

9. **Within each domain, the magnetic field of all electrons is?**

A: Parallel
B: Perpendicular
C: Opposite.
D: None of the above.

10. **The forces depicted in the figure below would result in?**



A: Tensile strain.
B: Volumetric strain.
C: Compressive strain.
D: Shear strain.

11. **Which of the following statement is true?**

A: Strain is an effect of stress
B: Stress is an effect of strain
C: Elasticity is an effect of stress
D: Elasticity is an effect of strain.

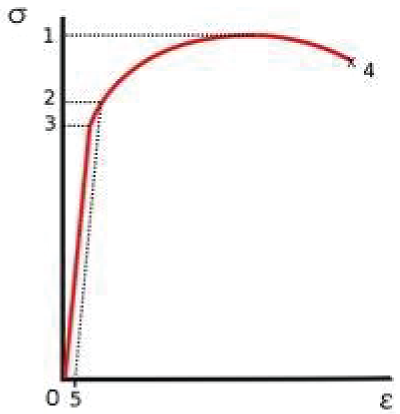
12. A wire is stretched by a force which causes an extension. The energy is stored in it only when:

- A: The weight of wire is negligible
- B: The crossectional area of wire remains constant
- C: The wire is not stretched beyond its elastic limit
- D: Extension of wire is proportional to applied force

13. Semiconductors have how many kinds of charge carriers?

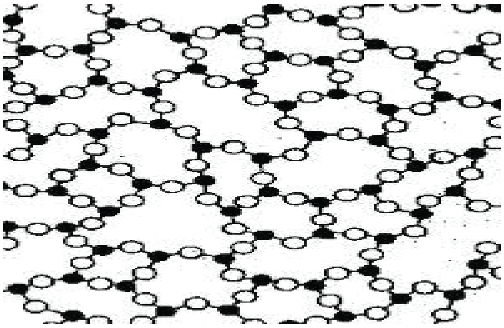
- A: 1
- B: 2
- C: 3
- D: 4

14. Identify yield point in the stress-strain curve given below?



- A: 1
- B: 2
- C: 3
- D: 4

15. The figure below show the pattern for?



- A: Crystalline solids
- B: Amorphous solids
- C: Polymeric solids
- D: None of the above.

16. An insulator has which of the following characteristics?

Empty conduction band (no free electrons)

A full valence band

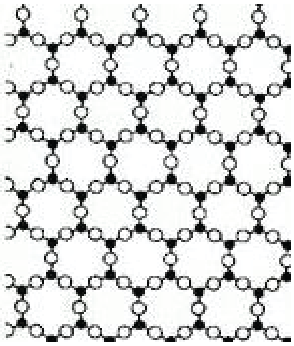
Large gap between conduction and valence band

- A: I only
- B: I and II only
- C: I and III only
- D: I, II and III

17. At 0 K semiconductors have?

- A: No electron in the conduction band.
- B: No electron in the valence band.
- C: No gap between valence and conduction band.
- D: Two free electrons.

18. The figure below shows the patters of?



- A: Crystalline solids
- B: Amorphous solids
- C: Polymeric Solids.
- D: None of the above.

19. Which of the following is NOT a crystalline solid?

- A: Copper
- B: Zinc
- C: Iron
- D: They are all crystalline solids.

20. Which of the following has intermediate structure between order and disorder?

- A: Crystalline solids.
- B: Amorphous solids.
- C: Polymeric solids.
- D: Glassy solids.

ELECTRONICS

TEST-1

1. Potential barrier across the PN junction of Germanium is?

- A: 0 V
- B: 0.3 V
- C: 0.7 V
- D: 0.9 V

2. Which of the following is the smallest section of a transistor in terms of size?

- A: Emitter
- B: Base
- C: Collector.
- D: They are all of same size

3. The P-N junction diode works as an insulator, if connected?

- A: To AC current
- B: Forward Biased
- C: Reverse Biased
- D: None of the above.

4. Transistor can be described as?

- A: Amplifier
- B: Switch
- C: Inverter
- D: All of the above.

5. Which of the following is the most commonly used material in the semi-conductors?

- A: Copper.
- B: Iron
- C: Soft Iron grains.
- D: Silicon.

6. Input resistance of operational amplifier is?

- A: Zero
- B: Minimal (less than 10 ohms)
- C: High (in the range of kilo ohms)
- D: Very high (in the range of mega ohms)

7. How many basic operations are there in Boolean algebra?

- A: 2
- B: 3
- C: 5
- D: 6

8. Any signal at the inverting input of the operational amplifier is?

- A: Amplified with a phase shift of 90^o
- B: Amplified with a phase shift of 180^o
- C: Amplified with a phase shift of 270^o
- D: Amplified with a phase shift of 360^o

9. When a PN junction is reverse biased, which of the following is true?

- A: Value of resistance is a few ohms
- B: Diode behaves as ohmic device.
- C: No current flows in the circuit.
- D: Electrons move across the PN junction.

10. Charge carriers are not present in?

- A: P region
- B: N region
- C: PN Junction
- D: Group 11 elements.

11. Semi conductor diodes may perform which of the following function?

- A: Rectification
- B: Emitt light
- C: Detect light
- D: All of the above.

12. Potential barrier across PN junction of silicon is?

- A: 0 V
- B: 0.3 V
- C: 0.7 V
- D: 0.9 V

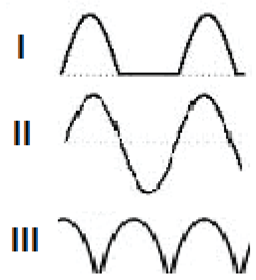
13. The manipulation of binary information is done by logic circuits called ____.

- A: Gates
- B: Trunks
- C: Truth tables
- D: Networks

14. Charge carrier in P region is?

- A: Electrons
- B: Protons
- C: Holes
- D: None of the above.

15. Which of the following is the output of the full wave rectifier?

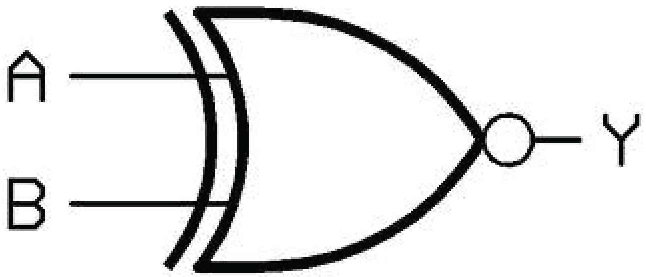


- A: I only
- B: II only
- C: III only
- D: Both I and III depending on the configuration.

16. NOT gate is also known as?

- A: Decoder
- B: Multiplexer
- C: Inverter.
- D: Encoder.

17. The gate given in the figure below is?



- A: XNOR
- B: XOR
- C: NOR
- D: NAND

18. The input-output relationship of gates is given by?

- A: Logic gates
- B: Algebraic Table
- C: Truth Table
- D: None of the above.

19. If V_o = 12 V and V_{in} is 2 * 10^{-2} volts. The gain of the amplifier is?

- A: 6
- B: 12
- C: 600
- D: 2400

20. The mathematical operation for NOR operation is

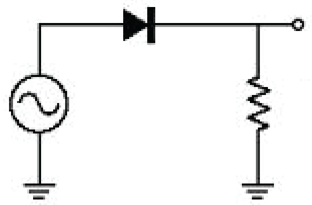
- A: $X = \overline{A + B}$
- B: $X = \overline{A.B}$
- C: $X = \overline{A + B}.\overline{A + B}$
- D: All of the above

TEST-2

1. **In a reverse bias, prior to the breaking point the current is?**

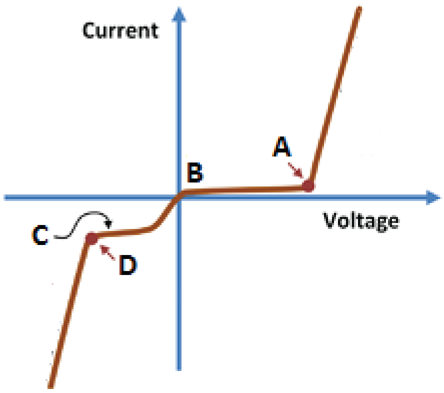
   - A: Proportional to voltage.
   - B: Constant.
   - C: Zero.
   - D: None of the above.

2. **The given would produce ?**



   - A: Half wave rectification with positive wave.
   - B: Half wave rectification with negative wave.
   - C: Full wave rectification
   - D: Smooth DC current.

3. **Potential barrier is broken at which point in the graph given below for a PN junction?**



   - A: A
   - B: B
   - C: C
   - D: D

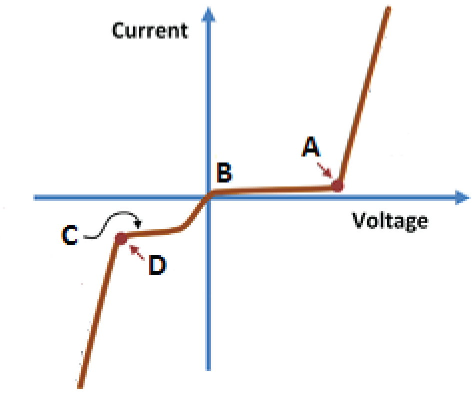
4. **An AND gate has four inputs A, B, C, D. The input that produces an output 1 is?**

- A: 0011
- B: 1000
- C: 0000
- D: 1111

5. **Which of the following may be used to smooth out the uni-directional wave?**

- A: Half wave rectifier
- B: Full wave rectifier
- C: Filter
- D: None of the above.

6. **For the graph given below, the PN junction is damaged at which point?**

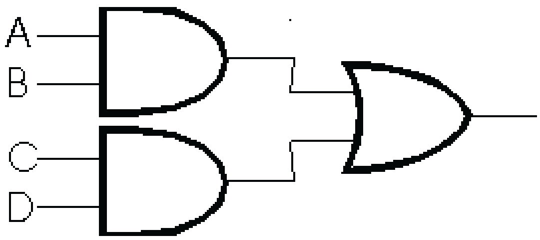


- A: A
- B: B
- C: C
- D: D

7. **For which of the following diodes P region surrounds the N region?**

- A: Photo voltaic cell.
- B: Light emitting diode.
- C: Photo diode.
- D: No diode has such junction arrangement.

8. **What is the output of the Boolean logic diagram given below,**



- A: $\overline{(A+B)}.\overline{C+D)}$
- B: $(\bar{A}+\bar{B}).(\bar{C}+\bar{D})$
- C: $\bar{A}\bar{B}+\bar{C}\bar{D}$
- D: AB + CD

9. **Which of the following statement is true about operational amplifiers?**

They have two input terminals.

They have one output terminal.

Open loop gain is zero.

- A: I only
- B: III only
- C: I and II only
- D: I, II and III.

10. **Which of the following statements is true?**

$I_E = I_B + I_C$ for NPN transistors
$I_E = I_B + I_C$ for PNP transistors
$I_E = I_C - I_B$ for PNP transistors

- A: I only
- B: II only
- C: I and II only.
- D: I and III only.

11. **Which of the following statement is true?**

P junction is formed by adding pentavalent impurity to a semiconductor.

N junction is formed by adding a trivalent impurity to a semiconductor.

- A: I only
- C: Both I and II
- B: II only
- D: Nether I nor II.

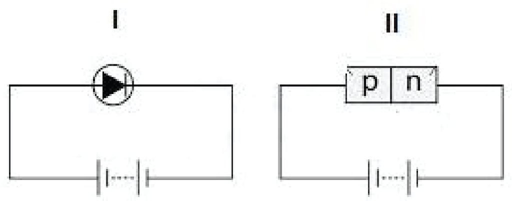
12. **The current gain β of a transistor is 40. To change the collector current by 160 mA at constant V_{CE}, the necessary change in the base current is?**

- A: 0.25
- C: 4 mA
- B: 4 micro A
- D: 40 mA

13. **For XOR gate output is 1 only if?**

- A: Both the inputs are 1.
- C: Both the inputs are same.
- B: Both the inputs are 0.
- D: Both the inputs are different.

14. **Which of the statements is true about the two circuit arrangements given below?**



- A: Only I is forward biased
- C: Both I and II are forward biased
- B: Only II is forward biased
- D: Neither I nor II is forward biased

15. Current flowing between two input terminals of operational amplifier is?

- A: Zero
- B: In the range of milli amperes.
- C: In the range of amperes.
- D: None of the above.

16. When trivalent impurity is added to a semiconductor, the resulting material is?

- A: P Junction.
- B: N Junction
- C: PN Junction
- D: None of the above.

17. Which of the following statement is true for the transistors?

Base is thinner than the emitter and collector

Base has larger concentration of impurity than emitter and collector.

Emitter has greater concentration of impurity than collector.

- A: I only
- B: II only
- C: I and III only
- D: I, II and III.

18. The collector current is 1.5mA. If the current gain is 50, the base current is?

- A: 3 μA
- B: 30 μA
- C: 150 μA
- D: 3 mA

19. Number of valence electrons in the semi-conductor materials is?

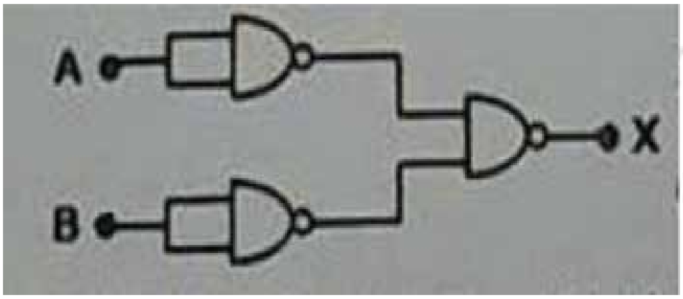
- A: 3
- B: 4
- C: 5
- D: 6

20. The base current is 50uA. If the current gain is 100, the collector current is closest in value to?

- A: 50uA
- B: 500 uA
- C: 2 mA
- D: 5 mA

TEST-3

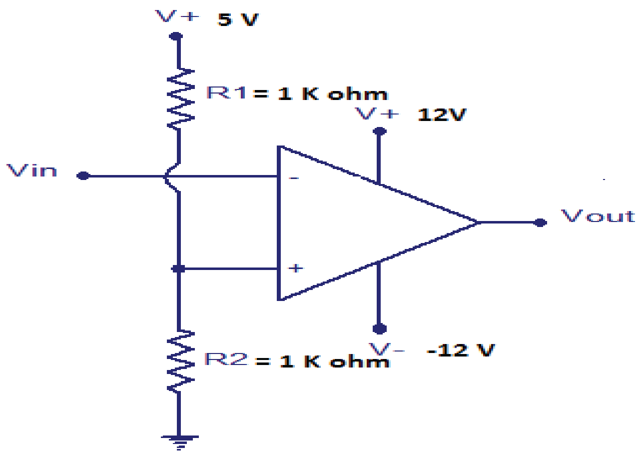
1. **The NAND gates are connected in the figure**



Which gate is formed at X?

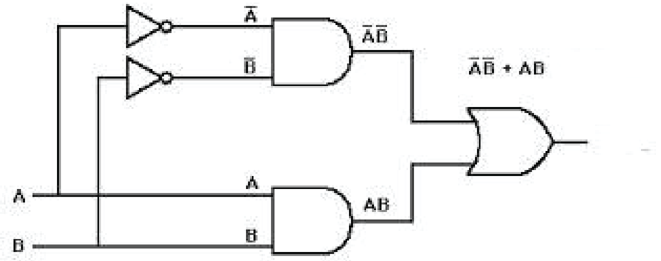
- A: OR
- B: AND
- C: NOR
- D: NAND

2. **If V_{in} is 5 V what is the V_{out} for the op-amp comparator given below?**



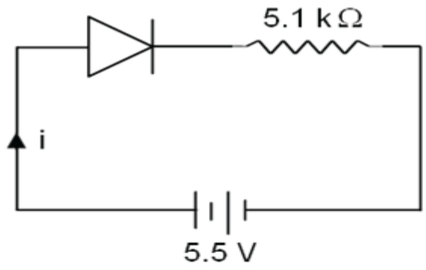
- A: 2.5 V
- B: 5 V
- C: 12 V
- D: -12 V

3. **The logic circuit given below is for which type of gate?**



- A: NOR
- B: XOR
- C: XNOR
- D: None of the above.

4. **A p-n junction diode is connected to a battery of emf 5.5 V and external resistance of 5.1 k ohm. The barrier potential in the diode is 0.4 V. The current in the circuit is?**



- A: 1.08 mA
- B: 0.08 mA
- C: 1 mA
- D: 1 A

5. **Which of the following semi-conductor diodes works in the reverse bias?**

- A: Light emitting diode.
- B: Photo diode.
- C: Photo voltaic cell.
- D: None of the above.

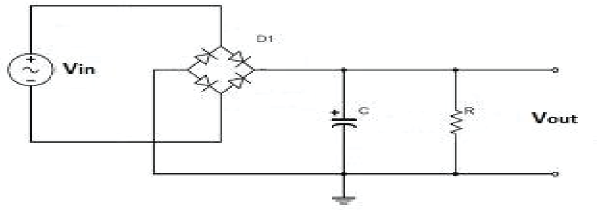
6. **In regard to NAND gate the following statements are made.**

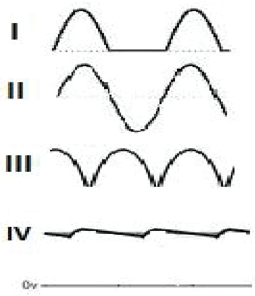
(1) It is equivalent to an AND gate followed by an inverter.
(2) If all the inputs are low, the output is low.
(3) If all the input is high the output is low.

Which of the above statements are correct?

- A: 1, 2 and 3
- B: 2 and 3
- C: 1 and 3
- D: 1 only

7. **If input to the circuit given below is an alternating sinosidal wave, output would be?**



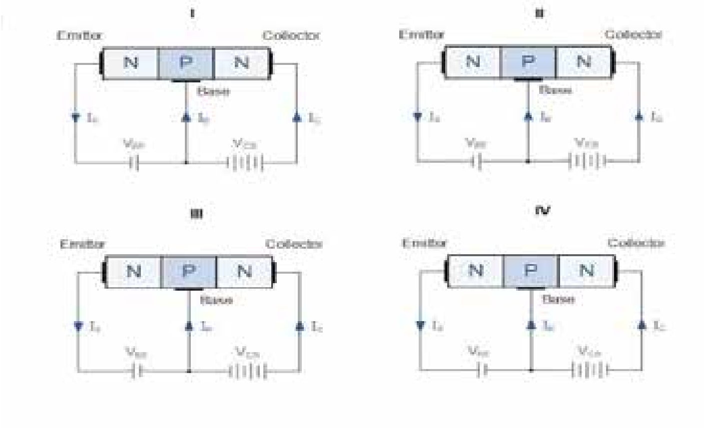


- A: I
- B: II
- C: III
- D: IV

8. **The current gain of a transistor in common emitter mode is 49. The change in collector current and emitter current corresponding to the change in base current by 5.0 µA, will be?**

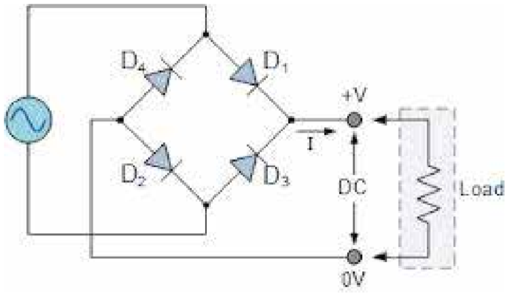
- A: 245 µA, 250 µA
- B: 240 µA, 235 µA
- C: 260 µA, 255 µA
- D: None of the above.

9. **Which of the following shows the normal operation for an NPN transistor?**



- A: I
- B: II
- C: III
- D: IV

10. **In the circuit below which diodes would be open during the positive half of the input wave? Input voltage is positive.**

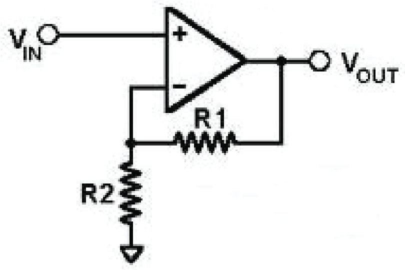


- A: D_4 and D_1
- B: D_2 and D_3
- C: D_4 and D_3
- D: D_1 and D_2

11. **In a reverse biased diode, when the applied voltage changes by 1 V, the current is found to change by 0.5 µA. The reverse bias resistance of the diode is?**

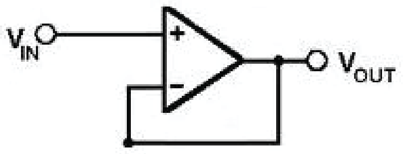
- A: $2 * 10^5$ ohms
- B: $2 * 10^6$ ohms
- C: Infinity.
- D: Cannot be determined.

12. If Vout = 10 V, R_1 = 200 k ohms and R_2 = 10 k ohms. What is gain of the given op-amp?



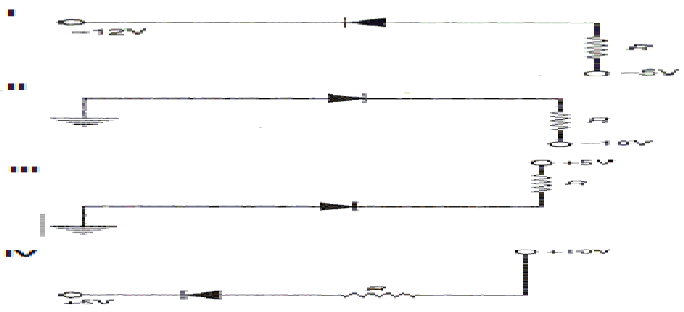
- A: Need information about V_{IN} to answer the question.
- B: 20
- C: 21
- D: 210

13. If V_{in} is 10 V what is the value of V_{out} for the circuit given below?



- A: 0 V
- B: 10 V
- C: Infinite
- D: Undetermined.

14. Which of the following diodes is/are reverse biased?

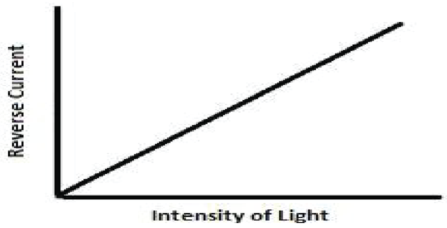


- A: I only
- B: III only
- C: IV only
- D: I, II and IV.

15. Which of the following diode works in the absence of any external bias?

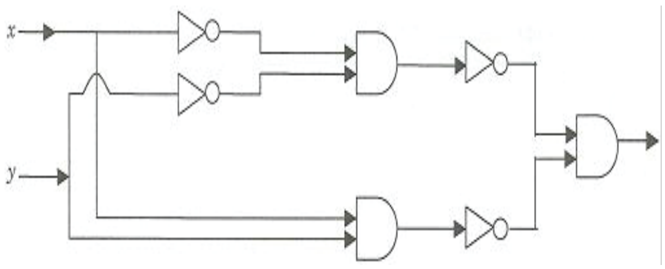
- A: Photo voltaic cell.
- B: Photo diode.
- C: Light emitting diode.
- D: None of the above.

16. The graphs below is for which kind of diode?



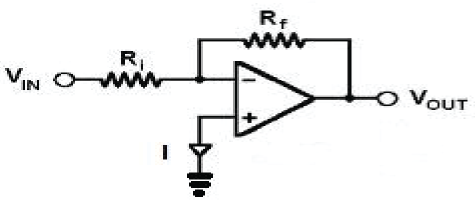
- A: Light emitting diode
- B: Photo diode.
- C: Photo voltaic cell.
- D: None of the above.

17. The logic circuit given below is for which type of gate?



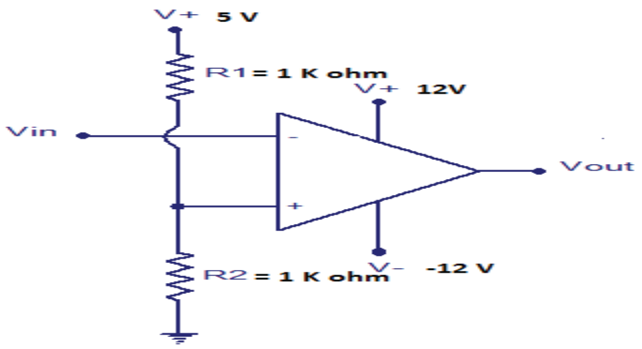
A: XNOR B: NAND C: NOR D: XOR

18. If V_{IN} = 2V, R_i = 10 K ohms and R_f = 20 K ohms. What is the current I flowing to the ground in the given circuit?



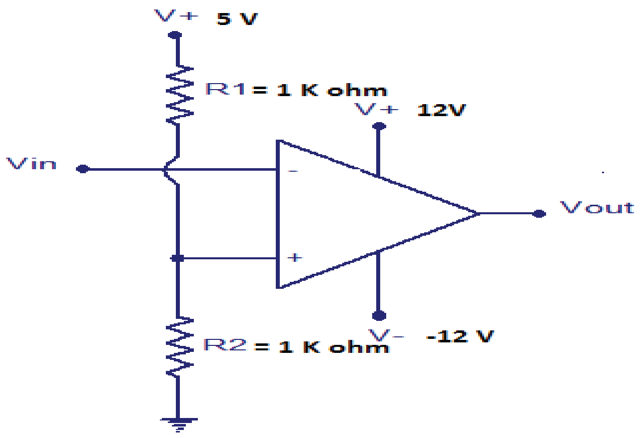
- A: 0 mA
- B: 0.2 mA
- C: 0.1 mA
- D: 0.06 mA

19. If V_{in} is a sinusoidal wave with peak of 5 V the output of the given circuit is?



- A: Sinusoidal wave with peak of 5 V
- B: Sinusoidal wave with peak of 12 V
- C: Square wave with peak of 5 V
- D: Square wave with peak of 12 V

20. If V_{in} = 2 V, what is V_{out} for the op-amp comparator given below?



- A: 2 V
- B: 5 V
- C: 12 V
- D: - 12 V

TEST-4

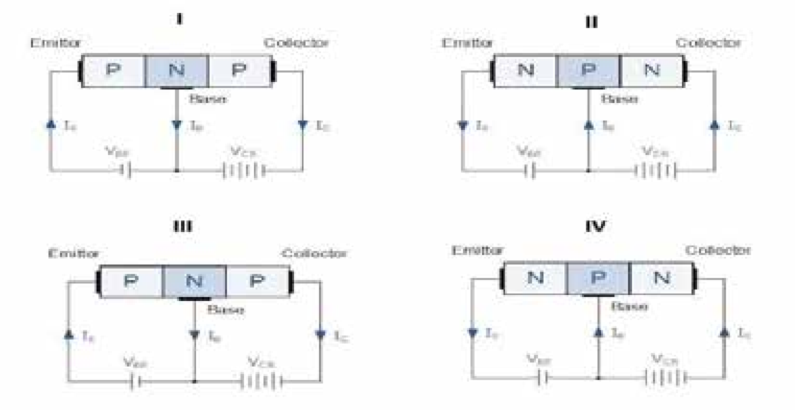
1. Transistor switch is turned off by?

- A: Setting base current to zero.
- B: Setting emitter current to zero.
- C: Setting collector current to zero.
- D: None of the above.

2. Gain of the transistor is given by the formula?

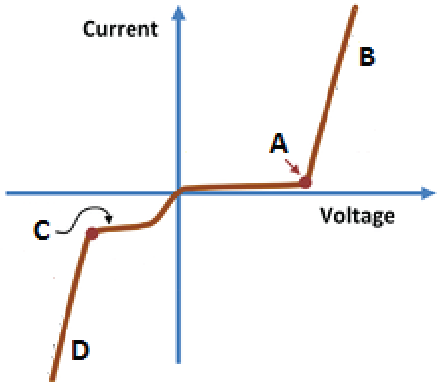
- A: I_E / I_B
- C: I_E / I_C
- B: I_C / I_B
- D: I_C / I_E

3. Which of the following arrangements show the normal operation of transistors?



- A: II only
- C: I and IV
- B: III only
- D: II and III

4. For the graph given below for a PN junction. Reverse current flows at which point?

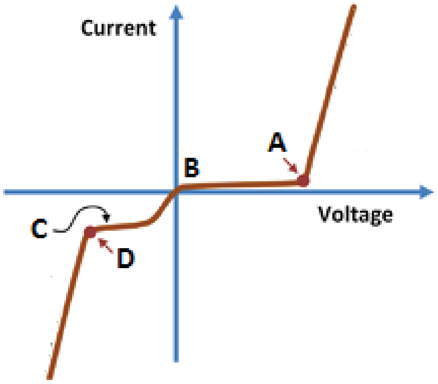


- A: A
- C: C
- B: B
- D: D

5. **Consider a logic circuit with three inputs A, B and C. The values assigned to A, B and C are such that** $\overline{ABC} = \overline{A + B + C}$ **Then** $\bar{A}BC + A\bar{B}C + AB\bar{C}$ **is equal to?**

- A: A + B + C
- B: ABC
- C: 0
- D: 1

6. **In the given graph for a PN juction, covalent bonds are broken at point?**



- A: A
- B: B
- C: C
- D: D

7. **The truth table given below is for what kind of gate?**

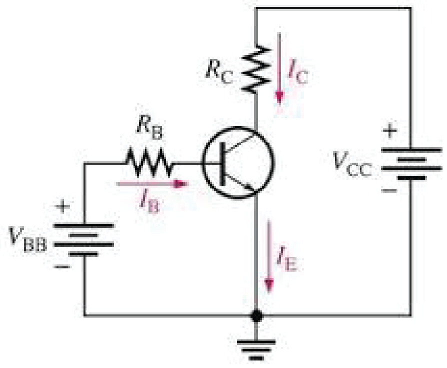
A	B	Output
0	0	0
1	0	0
0	1	0
1	1	1

- A: NAND gate
- B: NOR gate
- C: OR gate
- D: AND gate

8. Which of the following is applicable in respct to a P-N junction diode, which is not connected to any circuit?

- A: The potential is the same everywhere.
- B: P-type side is at a higher potential than N-type side.
- C: There is an electric field at the junction directed from N-type side to P-type side.
- D: There is an electric field at the junction directed from P-type side to N-type side.

9. Which of the statement is true regarding the NPN transistor in the figure below?



(a) *npn*

- A: $I_C < I_B < I_E$
- B: $I_B < I_C < I_E$
- C: $I_B < I_E < I_C$
- D: $I_E < I_C < I_B$

10. NOR function is the complement of?

- A: AND
- B: OR
- C: XNOR
- D: XOR

11. Which of the following statement is true about operational amplifiers?

They have very high input resistance

They have very low output resistance

Current flowing between two input terminals is zero.

- A: I only
- B: II only
- C: I & III only.
- D: I, II and III.

12. For normal operation of the transistor?

- A: Emitter Base junction and Collector Base junction both are reverse biased.
- B: Emitter Base junction is reverse biased and Collector Base junction is forward biased.
- C: Emitter Base junction and Collector Base junction both are forward biased.
- D: Emitter Base junction is forward biased and Collector Base junction is reverse biased.

13. As the voltage is increased In the reverse bias, the current? (assume functioning prior to the breaking point).

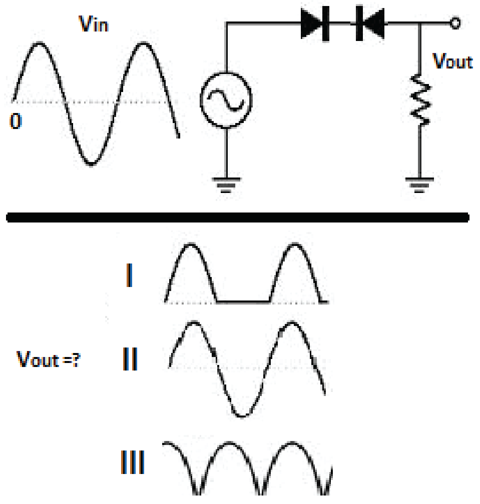
- A: Increases
- B: Decreases
- C: Remains constant
- D: Increase at a constant rate.

14. The truth table below is for which kind of gate?

A	B	Output
0	0	1
1	0	1
0	1	1
1	1	0

- A: AND gate
- B: NAND gate
- C: OR gate
- D: NOR gate

15. In the figure given below, the out put wave for V_{out} would be?

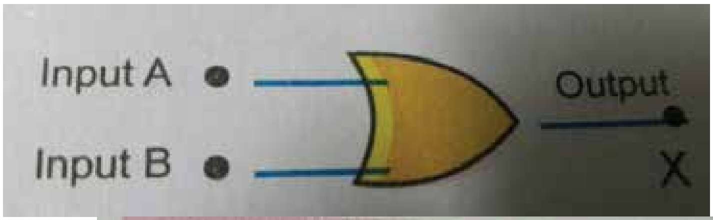


- A: I
- B: II
- C: III
- D: None of the above.

16. A P-N junction diode is said to be forward biased, when?

- A: no potential difference is applied across P and N region
- B: a potential difference is applied across P and N region making P region positive and N region negative
- C: a potential difference is applied across P and N region making P region negative and N region positive
- D: a magnetic field is applied in the region of junction

17. **Which one of the following is the truth table for following gate?**



A:

Table 18.6

A	B	Output
0	0	1
0	1	1
1	0	1
1	1	0

B:

A	B	Output
0	0	0
0	1	0
1	0	0
1	1	1

C:

A	B	Output
0	0	0
0	1	1
1	0	1
1	1	1

D: None of the above

18. If change in potential difference in a forward biased diode is 4 V and change in curren is 2 A. The forward resistance is?

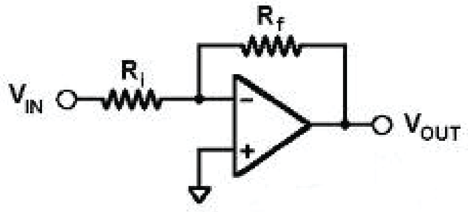
A: 8 ohm

B: 16 ohm

C: 2 ohms

D: 1 ohm

19. If V_{out} is 10 V, R_f = 150 K ohms and R_i = 50 k ohms. What is the gain for the op-amp given below?



A: Need information about V_{in} to find the gain.

B: 3

C: - 3

D: 200

20. Electrical conductivity of the semiconductors is?

A: Same as that of metals.

B: Higher than that of metals.

C: Lower than that of metals.

D: None of the above.

MODERN PHYSICS

TEST-1

1. In Davison – Germer experiment, the diffracted proton from crystal shows ____________?

- A: Particle property
- B: Wave property
- C: Quantum property
- D: Both B and C

2. A photon of wave length 100mm behaves like a particle of mass ________?

- A: 0 kg
- B: 5.53×10^{-36} kg
- C: 3.28×10^{-24} kg
- D: 2.21×10^{-41} kg

3. The reverse process of pair-production is?

- A: Annihilation
- B: Fission
- C: Fusion
- D: Materialization.

4. Bones absorb greater amount of incident Xrays. This is because of the fact that

- A: Bones lie below flesh
- B: Bones are light in color
- C: Bones contain material of low densities
- D: Bones contain material of high densities

5. A photon can eject an electron from the surface of a photovoltaic metal if and only if

- A: the frequency of the photon is above the activation minimum.
- B: the wavelength of the photon is above the activation minimum.
- C: the speed of the photon is above an activation minimum.
- D: the momentum of the photon is below the activation minimum.

6. Minimum photon energy for pair production is?

- A: 0.25 MeV
- B: 0.51 MeV
- C: 1.02 MeV
- D: 2.04 MeV

7. Cobalt 60 is used in medicine and is an intense source of

- A: Neutrons
- B: α-particle
- C: β-particle
- D: γ-rays

8. As per special theory of relativity which of the following is not an absolute quantity.

Time

Length

Mass

- A: I and II only
- B: I and III only
- C: II and III only
- D: I, II and III

9. Object A, B and C are moving with velocity 0.7c, 0.8c and 0.9c in parallel to a meter rod. Which of these would see the highest contraction is length?

- A: A
- B: B
- C: C
- D: All would observe same length.

10. Which of the following is not an inertial frame of reference?

- A: Earth
- B: Geostationary satellite.
- C: Accelerating train.
- D: Car moving with uniform velocity.

11. Stopping potential for a metal surface incase of photo electric emission depends on?

- A: The threshold frequency for the metal surface.
- B: The intensity of incident light
- C: The frequency of incident light
- D: None of these

12. Which of the following is correct about the photo electric current?

- A: Current is proportional to the frequency of light.
- B: Maximum kinetic energy is proportional to the frequency of light.
- C: Increasing light intensity increases the kinetic energy of the photons.
- D: Both A & C.

13. Quantum theory states that energy of each particle is proportional to?

- A: Wavelength.
- B: Frequency
- C: Planks constant.
- D: Both B & C

14. The high energy electrons penetrate the specimen to reasonable thickness and acquire sufficient energy due to it's?

- A: Short wavelength.
- B: Long wavelength.
- C: Extremely short wavelength.
- D: None of the above.

15. Mass m of an object moving with velocity 0.8c is?

- A: $0.8\ m_0$
- B: $1.3\ m_0$
- C: $1.6\ m_0$
- D: $2.4\ m_0$

16. The velocity of particle of mass m of de-Broglie wave length λ is ________?

- A: $2h / m\lambda$
- B: mc / h
- C: hc^2 / λ
- D: $h / m\lambda$

17. Select an alternative form of uncertainty principle from the following?

- A: h/mc
- B: $\Delta E.\Delta T \sim h$
- C: $mc^2 = hf$
- D: Any of the above

18. Which of the following statement is true about a black body?

- A: It is an ideal absorber of radiation but non ideal emitter of radiation.
- B: It is an ideal emitter of radiation but non ideal absorber of radiation.
- C: It is an ideal absorber of radiation and ideal emitter of radiation.
- D: It is a non ideal absorber of radiation and non ideal emitter of radiation.

19. In Compton Effect, which law/laws are conserved?

- A: Conservation of energy.
- B: Conservation of momentum.
- C: Both A & B.
- D: None of the above.

20. An increase in temperature has what effect on the radiation?

- A: It becomes richer in shorter wavelengths.
- B: It becomes richer in longer wavelengths.
- C: Temperature has no effect on radiation wavelength.
- D: Radiation wavelengths follow a bell curve with increase in temperature.

TEST-2

1. **Helium-Neon lasers are used for:**

   - A: Precision measurement of range finding
   - B: Welding detached bone of a body
   - C: Optical fibre communication systems
   - D: Surveying for construction of tunnels

2. **A blackbody at temperature 17 centigrade shall radiate most energy at the wavelength of? Wien's constant = $2.9 * 10^{-3}$ mK.**

   - A: 1 μm
   - B: 10 μm
   - C: 17 μm
   - D: 170 μm

3. **Which of the following is Stephen's constant?**

   - A: $\lambda_{max} * T = 2.9 * 10^{-3}$ Mk
   - C: $c = 3 * 10^{8}$ m/s
   - B: $h = 6.63 * 10^{-34}$ Js
   - D: $\sigma = 5.67 * 10^{-8}\ Wm^{-2}K^{-4}$

4. **What is the type of characteristic X-ray photon whose energy is given by relation '$hf=E_M-E_K$'?**

   - A: K-alpha
   - C: K-beta
   - B: M-alpha
   - D: M-beta

5. **What is the energy of each photon released in the annihilation of electron and positron?**

   - A: 1.02 MeV
   - C: 4.08 MeV
   - B: 2.04 MeV
   - D: None of the above.

6. **Which of the following statement is true about two postulates of special theory of relativity?**

   Laws of physics are same in all inertial frame of references.

   Speed of light is constant and independent of the relative motion.

   Speed of light is constant but for objects moving with speed closes to c.

   - A: I and II
   - C: II and III
   - B: I only
   - D: III only.

7. **Sodium-24 has half life of 15 hours and it is used to estimate :**

   - A: Kidney function
   - C: Iron in plasma
   - B: Plasma blood volume
   - D: Thyroid function

8. What will be the relation for the speed of electron accelerated towards the target in X-ray tube by applying potential difference 'V'; take mass of electron 'm' and charge on electron 'e'?

- A: $v=(2Ve/m)^{1/2}$
- B: $v=(2V/me)^{1/2}$
- C: $v=(2me/V)^{1/2}$
- D: $v=(2Vem)^{1/2}$

9. Plank's theory holds good for?

- A: Shorter wavelengths.
- B: Larger wavelengths.
- C: All wavelengths.
- D: None of the above.

10. The equations of pair production are?

- A: $hf = 2m_oc^2 - KE(e^-) + K.E\ (e^+)$
- B: $hf = 2m_oc^2 + KE(e^-) + K.E\ (e^+)$
- C: $hf = 2m_oc^2 - KE(e^-) - K.E\ (e^+)$
- D: $hf = 2m_o^2c + KE(e^-) + K.E\ (e^+)$

11. If the wave length of incident radiation is decreased in photo emission, then _________?

- A: The minimum kinetic energy of the photo electrons increase
- B: The minimum kinetic energy of the photoelectrons decrease
- C: The average kinetic of the photoelectrons decrease
- D: The maximum kinetic energy of the photoelectrons increase

12. In a photo electronic effect, monochromatic light, is incident on a metal surface. If the incident light of twice the intensity but the same wave length, the kinetic energy of the emitted electron ______?

- A: Becomes double.
- B: Remains same.
- C: Becomes half.
- D: First increase then decreases because of curvilinear graph.

13. If work function is 4.14ev, the threshold frequency of incident light is ?

- A: 10^{12} Hz.
- B: 10^{13} Hz.
- C: 10^{14} Hz.
- D: 10^{15} Hz.

14. During the production of LASER,when the excited state E_2contains more number of atoms than the ground state E_1,the state is known as:

- A: Population inversion
- B: Ground state
- C: Excited state
- D: Metastable state

15. Which one of the following has the largest energy content?

- A: Photons of wavelength 2pm (Y-rays)
- B: Photons of wavelength 1mm (X-rays)
- C: Photons of wavelength 50mm (Infrared)
- D: Photons of wavelength 200mm (UV)

16. Which of the following is correct relationship between the momentum and wavelength of photons?

- A: P = h * λ
- B: P = h * λ / c
- C: P = h / λ
- D: P = h * c / λ

17. In electron microscope, electric and magnetic field are used as _______?

- A: Electromagnetic gun
- B: Source of electromagnetic waves
- C: Deflected charged particle
- D: Converging source of electrons

18. Helium-Neon lasers are used for:

- A: Precision measurement of range finding
- B: Welding detached bone of a body
- C: Optical fibre communication systems
- D: Surveying for construction of tunnels

19. A photon of energy 4 eV is incident on a metal surface whose work function is 2 eV. The minimum reverse potential to be applied for stopping the emission of electrons, is ?

- A: 2 V
- B: 4 V
- C: 6 V
- D: 8 V

20. Which of the following is the practical application of Xrays?

- A: MRI
- B: Ultrasonography
- C: Computerized Axial Topography
- D: Positron Emission Technology

TEST-3

1. **When a light of wavelength 300 nm falls on a photoelectric emitter (A), the photoelectrons are liberated. For another emitter (B), the light of wavelength 600 nm is sufficient for liberating photoelectrons. The ratio of the work function of the two emitters A : B, is?**

- A: 2 : 1
- B: 1 : 2
- C: 4 : 1
- D: 1 : 4

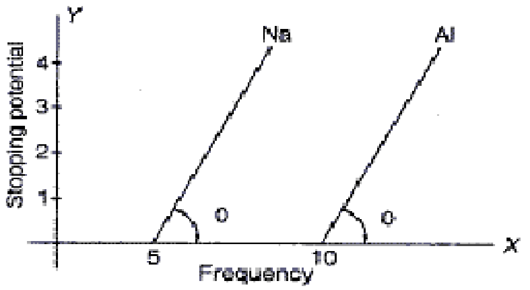
2. **Photons of energy 6 eV, are incident on a surface of work function 2.1 eV. What will be the stopping potential?**

- A: -1.9 V
- B: -3.9 V
- C: -5.0 V
- D: -8.3 V

3. **A photosensitive metallic surface has work function, h v_0. If photons of energy 2 hv_0 fall on this surface, the electrons come out with a maximum velocity of 4 x 10^6 m/s. When the photon energy is increased to 5 hv_0, the maximum velocity of photoelectrons will be?**

- A: 2 x 10^6 m/s
- B: 2 x 10^7 m/s
- C: 8 x 10^4 m/s
- D: 8 x 10^6 m/s

4. **From the figure, describing photoelectric effect, we may infer correctly that?**



- A: Na and Al both have the same threshold frequency.
- B: Maximum kinetic energy for both the metals depend linearly on the frequency.
- C: The stopping potentials are different for Na and Al for the same change in frequency.
- D: Al is a better photosensitive material than Na.

5. **Life time of an electron in energized state is 10^{-10}s. What is the uncertainity in energy during this time?**

- A: 6.63 * 10^{-24} J
- B: 6.63 * 10^{-44} J
- C: 1.05 * 10^{-24} J
- D: 1.05 * 10^{-44} J

6. **The mass of an object will be doubled at speed?**

- A: $(0.25)^{-2}$ * c
- B: $(0.40)^{-2}$ * c
- C: $(0.65)^{-2}$ * c
- D: $(0.75)^{-2}$ * c

7. The radiation emitted by human body lies in the range of ?

- A: Infrared region
- B: Visible region
- C: UV region
- D: None of the above.

8. If energy of photon is 5 MeV. Kinetic energy of particles after pair production is?

- A: 4 MeV
- B: 5 MeV
- C: 6 MeV
- D: Not enough information given.

9. As temperature increases λ_{max} for a black body?

- A: Moves towards shorter wavelengths.
- B: Move towards longer wavelengths.
- C: T has no effect on λ_{max}
- D: None of the above.

10. What is the de Broglie wavelength of a particle of mass 2 mg moving with speed of 1 m/s.

- A: $1.2 * 10^{-28}$ m
- B: $2.8 * 10^{-28}$ m
- C: $3.3 * 10^{-28}$ m
- D: $4.6 * 10^{-28}$ m

11. X-rays from a given X-ray tube operating under specified conditions have a minimum wavelength. The value of this minimum wavelength could be reduced by:

- A: Cooling the target
- B: Increasing the potential difference between the cathode and the target
- C: Reducing the temperature of the filament
- D: Reducing the pressure in the tube

12. Two identical photocathode's receive light of frequencies, f_1 and f_2 . If the velocities of the photoelectrons (of mass m) coming out are v_1 and v_2 respectively , then?

- A: $v_1^2 - v_2^2 = \frac{2h}{m}(f_1 - f_2)$
- B: $v_1^2 - v_2^2 = \frac{2h}{m}(f_1 - f_2)^2$
- C: $v_1^2 - v_2^2 = (\frac{2h}{m}f_1 - f_2)^2$
- D: None of the above.

13. Kg mass will be equivalent to?

- A: 0.25 GWh
- B: 2.5 GWh
- C: 25 GWh
- D: 250 GWh

14. After traveling through a vacuum, a photon of light entering into some transparent denser medium. The energy of photon?

- A: Remains same
- B: Decease because speed decrease
- C: Increase because wave light decrease
- D: Increase and then decrease

15. An observer shoots perpendicular to a meter stick at very high speed (relativistic) and finds that the length of meter stick is?

- A: Greater than one meter.
- B: Less than one meter.
- C: One meter.
- D: None of the above.

16. The work function of a substance is 4.0 eV. The longest wavelength of light that can cause photo electron emission from this substance is approximately?

- A: 540 nm
- B: 400 nm
- C: 310 nm
- D: 220 nm

17. A photon of energy 8 eV is incident on metal surface of threshold frequency 1.6×10^{15} Hz. The kinetic energy of the photoelectrons emitted (in eV) is (Take $h = 6 \times 10^{-34}$ Js)?

- A: 1 eV
- B: 2 eV
- C: 3 eV
- D: 4 eV

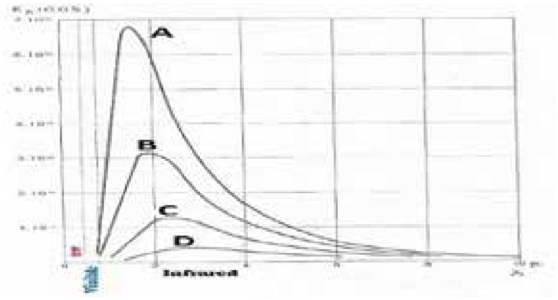
18. Which of the following is most easily detected as quantum radiation?

- A: Radio waves
- B: Infra-red
- C: Ultra violet
- D: Gamma Rays.

19. Photo electric effect for visible light can be obtained from?

- A: Sodium – Potassium
- B: Carbon – oxygen
- C: Helium – Neon
- D: None

20. The graph shows the intensity radiated against wavelength for a black body at different temperatures. Which of the following curve shows the energy radiated at highest temperature?



- A: A
- B: B
- C: C
- D: D

TEST-4

1. **There are n_1 photons of frequency v_1 in a beam of light. In an equally energetic beam, there are n_2 photons of frequency v_2 . The correct relation is?**
   - A: $n_1 / n_2 = v_1 / v_2$
   - B: $n_1 / n_2 = 1$
   - C: $n_1 / n_2 = v_2 / v_1$
   - D: $n_1 / n_2 = (v_1 / v_2)^2$
2. **If electrons of charge "e" moving with velocity "v" are associated through a potential difference "V" and strike a metal target, then velocity of electron is :**
   - A: Ve/m
   - B: $\sqrt{Ve/m}$
   - C: $\sqrt{Ve/2m}$
   - D: $\sqrt{2Ve/m}$
3. **The uncertainty in momentum and position of a particle is due to its ___________?**
   - A: Property of matter and radiation
   - B: Two dimensional motions
   - C: Emotion of certain wave length
   - D: Very high velocity
4. **If n number of photon is striking on a metal surface, then the total momentum exerted is ______?**
   - A: nh / λ
   - B: $2nh / \lambda$
   - C: Zero
   - D: $nh\lambda$
5. **Time dialation of 3s oscillation for an observing object moving with velocity 0.95c is?**
   - A: 4.2s
   - B: 5.8s
   - C: 6.4s
   - D: 9.6s
6. **If light enters a denser medium, its speed?**
   - A: Decreases,
   - B: Increases.
   - C: Remains same.
   - D: First decrease then increase.

7. What is the speed of the electron if it is to be confined in a space of 10^{-10} m ? Mass of electron is $9 * 10^{-31}$ Kg.

- A: $1.15 * 10^6$ m/s
- B: $3.42 * 10^6$ m/s
- C: $7.35 * 10^6$ m/s
- D: None of the above.

8. The distance between atoms is 0.30nm. What will be the wavelength at an angle of 30 degrees for the first order of diffraction?

- A: 0.60
- B: 0.30
- C: 0.20
- D: 0.90

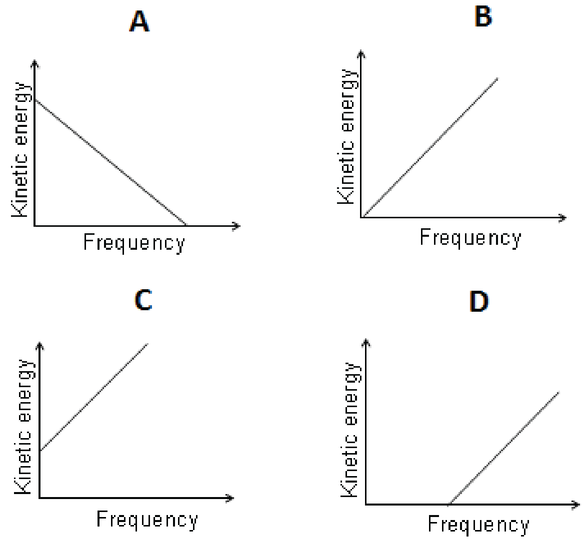
9. Uncertainity principle states that?

- A: Position and energy of a particle cannot be simultaneously measured with accuracy.
- B: Energy and momentum of a particle cannot be simultaneously measured with accuracy.
- C: Mass and energy of a particle cannot be simultaneously measured with accuracy.
- D: Position and momentum of a particle cannot be simultaneously measured with accuracy.

10. Which of the following statements is not consistent with Bohr's set of postulates regarding the hydrogen atom model with regard to the emission and absorption of light?

- A: Energy levels of the electrons are stable and discrete
- B:
An electrons emits or absorbs radiation only when making a transition from one energy level to another
- C:
To jump from a lower energy to a higher energy, an electron must absorbs photon of precisely the right frequency such that the photon's energy equals the energy difference between the two orbits
- D:
To jump from a higher energy to a lower energy, an electron absorbs a photon of a frequency such that photon's energy is exactly the energy difference between the two orbits

11. According to Einstein's photoelectric equation, the graph between the kinetic energy of photoelectrons ejected and the frequency of incident radiation is?



- A: A
- B: B
- C: C
- D: D

12. Maximum Kinetic Energy of electrons in the photo electric effect is?

- A: Proportional to the intensity of light.
- B: Proportional to the frequency of light.
- C: Independent of both intensity and frequency of light.
- D: Both A & B.

13. Photons A, B, C and D have wavelengths λ, 2λ, 3λ, 4λ. Which of the following is true about photons?

A has highest momentum
D has highest momentum
Momentum of A is four times that of D.

- A: I only
- B: II IIonly
- C: I and III only
- D: II and III only.

14. Rest mass of photon is?

- A: Zero
- B: Infinite
- C: Very small.
- D: Undetermined

15. Emission of radiation from radioactive substance is:

- A: Dependent on both temperature and pressure
- B: Independent of temperature but dependent on pressure
- C: Independent of both temperature and pressure
- D: Independent of pressure but dependent on temperature

16. Which of the following quantity / is increase for an object moving with speed approaching c?

Time

Length

Mass

- A: I only
- B: I and II only.
- C: I and III only
- D: I, II and III.

17. Which of the following is Planck's constant?

- A: $\lambda_{max} * T = 2.9 * 10^{-3}$ mK
- B: $h = 6.63 * 10^{-34}$ Js
- C: $c = 3 * 10^{8}$ m/s
- D: $\sigma = 5.67 * 10^{-8}$ $Wm^{-2}K^{-4}$

18. How many photons are released in the annihilation of electron and positron?

- A: 1
- B: 2
- C: 3
- D: Undetermined.

19. Sodium surface is successively illuminated by ultraviolet and visible radiations and the stopping potential is determined. This stopping potential is?

- A: Equal in both cases.
- B: More for ultraviolet.
- C: More for visible light.
- D: Varies randomly.

20. The anti-particle of electron is?

- A: Proton
- B: Neutron
- C: Positron
- D: Meson

ATOMIC SPECTRA

TEST-1

1. **The value of Rydberg's constant is?**
   - A: $1.0974 \times 10^{7}\ m^{-1}$
   - C: 6.63×10^{-34} JS
   - B: $1.0974 \times 10^{-7}\ m^{-1}$
   - D: -6.63×10^{-34} JS

2. **Laser beam can be used for?**
   - A: Welding of detached retinas.
   - B: Destroy tissues in a localized area.
   - C: Sealing off capillaries for the prevention of disease.
   - D: All of the above.

3. **Which of the following defines the excitation potential?**
   - A: Potential of electron in the first orbital.
   - B: Potential of electron in the orbital's greater than one.
   - C: Potential required taking a proton out of the nucleus.
   - D: Potential required lifting electron from ground state to some higher state.

4. **LASER is the acronym for?**
   - A: Linear Amplification by Standard Emission of Radiation
   - B: Light Amplification by Stimulated Emission of Radiation
   - C: Light Amplification by Series Emission of Radiation
   - D: Linear Amplification by Series Excitation of Radiation

5. **In X-ray tube, electrons after being accelerated through velocity v strike the target, then the wavelength of emitted X-rays is :**
   - A: Not greater than hc / eV
   - C: Equal to hc / eV
   - B: Not less than hc / eV
   - D: equal to h / mV

6. **Which one of the following is most coherent?**
   - A: X - rays
   - C: y - rays
   - B: Normal light
   - D: Laser

7. **Which of the following is same for the three spectral series in the infrared region?**
   - A: Frequency
   - C: Wavelength
   - B: Velocity
   - D: All of the above

8. In obtaining an x-ray phonographs of our hand, we use the principle of ?

- A: Photoelectric effect
- B: Ionization
- C: Shadow photograph
- D: Chromatography

9. In laser production, the state in which more atoms are in the upper state then in the lower one is called?

- A: Population inversion
- B: Normal state
- C: Meta stable state
- D: High energy state

10. When we excite some atoms by heat collusion or electrical charge, they will ?

- A: Radiate electromagnetic energy with a continuous distribution of wavelength.
- B: Radiate electromagnetic energy of discrete characteristic wavelength.
- C: Absorb particular wavelengths when white light is incident on them.
- D: Radiate electromagnetic energy as band of wavelengths.

11. The ionization energy of H - atom is ?

- A: 0 eV
- B: 13.6 eV
- C: - 13.6 eV
- D: 3.4 eV

12. Electron cannot exist in the nucleus, it is confirmed by observing that ?

- A: At does emit Y-radiation.
- B: Its size as compare to proton and neutron is very small.
- C: No antiparticle of electron is present.
- D: In order to do that the velocity of electron must be more than light according to uncertainty principle.

13. Wavelength of Balmer series is give by?

- A: $\frac{1}{\lambda} = R_h\left(\frac{1}{1^2} - \frac{1}{n^2}\right)$
- B: $\frac{1}{\lambda} = 1/R_h\left(\frac{1}{1^2} - \frac{1}{n^2}\right)$
- C: $\frac{1}{\lambda} = R_h\left(\frac{1}{2^2} - \frac{1}{n^2}\right)$
- D: $\frac{1}{\lambda} = 1/R_h\left(\frac{1}{3^2} - \frac{1}{n^2}\right)$

14. In He - Ne laser, the lazing action is produced by ?

- A: Ne only
- B: He - Ne combined.
- C: He only
- D: Either or them.

15. Laser is a device which can produce?

- A: An intense beam of light.
- B: Coherrent light.
- C: Monochromatic light.
- D: All of the above.

16. According to Bohr's theory the outer orbit Electron has ______energy than inner orbits ?

- A: Greater
- B: Smaller
- C: Equal
- D: Higher or lower (depending on the elements)

17. A white disk and a black disk are placed on top of a snow bank on a sunny day. The black disk sinks deeper into the snow because

- A: the black disk reflects light better.
- B: the white disk reflects light better.
- C: the black disk radiates heat better.
- D: the white disk radiates heat better.

18. The velocity of laser light is?

- A: Less than ordinary light.
- B: More than ordinary light.
- C: Equal to the ordinary light.
- D: Different for different colors of frequency.

19. In population inversion, atoms can reside in excited state for :

- A: 10^{-11}
- B: 10^{-8}
- C: 10^{-7}
- D: 10^{-3}

20. X-rays are ?

- A: Unknown in nature.
- B: High energy photons.
- C: High energy electrons.
- D: Radioisotopes.

TEST-2

1. **For the given choices, the photon of highest frequency will be absorbed when an electron jumps from ?**

   - A: 1^{st} to 5^{th} orbit
   - B: 2^{nd} to 5^{th} orbit
   - C: 3^{rd} to 5^{th} orbit
   - D: 4^{th} to 5^{th} orbit

2. **A hydrogen electron gains enough energy to rise from the n=1 to the n=5 energy level. How much energy does it gain?**

   $-.38eV$ ________ n=7

   $-.54eV$ ________ n=6

   $-.85eV$ ________ n=5

   $-1.25eV$ ________ n=4

   $-3.39eV$ ________ n=3

   $-13.6eV$ ________ n=1

   - A: $+.88eV$
   - B: $+2.54eV$
   - C: $+10.21eV$
   - D: $+12.75eV$

3. **If electron in the hydrogen atom moves to 5th shell from the higher shells, it releases which of the following series?**

   - A: Balmer series
   - B: Paschen series
   - C: Brackett series
   - D: Pfund series

4. **What is the order of wavelength of X-rays?**

   - A: 10^{-6} m
   - B: 10^{-10} m
   - C: 10^{-3} m
   - D: 10^{0} m

5. **The quantized energy of Bohr orbit of hydrogen atom is given by?**

   - A: $E_n = - n/E_o$
   - B: $E_n = - E_o/n$
   - C: $E_n = - E_o/\sqrt{n}$
   - D: $E_n = - E_o/n^2$

6. **Laser is an acronym for:**

   - A: Light annihilation by stimulated emission of radiation
   - B: Light amplification by stimulated emissions of radiations
   - C: Light amplitude of stimulated emissions of radiation
   - D: Light amplification by stimulated emission of radio

7. **Ground state energy of the 4^{th} orbital in a H-atom is ?**

   - A: - 13.60 eV
   - B: - 3.40 eV
   - C: -1.51eV
   - D: - 0.85 eV

8. **4200 volt is used in X-ray tube to accelerate the electrons to the speed of X-rays equal to?**

- A: 2×10^8 m/s
- B: 3×10^8 m/s
- C: 2×10^7 m/s
- D: 3×10^9 m/s

9. **Reflecting mirrors in lasers are used for which of the following purpose?**

- A: Improve the life of the laser.
- B: Confine the emitted photons to stimulate further emission from other excited atoms.
- C: Improve frequency of the emitted light.
- D: All of the above.

10. **Process of generating three dimensional images of the object is called?**

- A: Photography
- B: 3-D cinema
- C: Holography
- D: Temography

11. **X - rays can penetrate into a solid matter upto ?**

- A: Several micrometers
- B: Several millimeters
- C: Several centimeters
- D: Several meters

12. **Which of the following property must be there in a substance so that it can be used as target in X-ray tube?**

- A: It must have low melting point
- B: It must have low atomic number
- C: It must have high atomic number
- D: It must have high reflecting ability

13. **Wave like characteristic of electron is demonstrated by ?**

- A: Line spectrum of atoms
- B: Diffraction by crystalline solids
- C: Production of X-rays
- D: Photo electric effect

14. **What will be the energy of the accelerated electron used to produce X-rays when the accelerating potential is 2KV?**

- A: 2×10^{19}J
- B: 1.6×10^{19}J
- C: 3.2×10^{19}J
- D: 3.2×10^{-16}J

15. If an electron in 'K' shell is removed and an electron from 'L' shell is jump to occupy the hole in 'K' shell, It emits a photon of energy:

- A: $hc=E_L-E_K$
- B: $h / c_{Ka} = E_L-E_K$
- C: $hf_{Ka}=E_L-E_K$
- D: $hf_{Ka}=E_K-E_L$

16. Laser light is monochromatic which means:

- A: It consists of one wavelength
- B: It consists of photons having 1 eV energy
- C: It consists of one ray of light
- D: It consists of carbon monoxide gas

17. A laser beam is:

- A: Non-coherent
- B: Mono-chromatic
- C: Both
- D: None

18. The meta stable state for an atom in laser light is?

- A: 10^{-3} sec
- B: 10^{-4} sec
- C: 10^{-5} sec
- D: 10^{-8} sec

19. Continuous spectra are an example of?

- A: Atomic spectrum
- B: Molecular spectrum
- C: Black body radiation
- D: None of the above

20. The kinetic energy K.E with which the electron strikes the target is given by:

- A: $K.E = hf^2$
- B: $K.E = eV$
- C: $K.E = e^2V$
- D: $K.E = hc/\lambda$

TEST-3

1. **If the radius of the first atomic orbital in the Bohr's model is 0.053 nm then the raidus of the third orbital is?**

   - A: 0.159 nm
   - B: 0.212 nm
   - C: 0.318 nm
   - D: 0.477 nm

2. **In the case when electrons loose all their energy in the first collision the X-ray photons emitted has which set of frequency and wavelength?**

   - A: f_{min} λ_{min}
   - B: f_{min} λ_{max}
   - C: f_{max} λ_{min}
   - D: f_{max} λ_{max}

3. **Brackett series is obtained when all transition of electron terminate on?**

   - A: 3rd orbit
   - B: 4th orbit
   - C: 5th orbit
   - D: 6th orbit

4. **Quality of X-rays depends upon?**

   - A: Filament current
   - B: Potential difference between the cathode and anode
   - C: Material of the target
   - D: Both A and B.

5. **In an X-ray tube, electrons each of charge 'e' are accelerated through the potential difference 'V' and allowed to hit a metal target, the maximum frequency of the X-rays emmited is ?**

   - A: hc/eV
   - B: he/Vc
   - C: eV/h
   - D: Impossible to predict

6. **As per the de-Broglie's interpretation of the Bohr's atomic model the speed of the orbital electrons?**

   - A: Is constant for all the orbitals.
   - B: Decreases in the higher orbitals.
   - C: Increases in the higher orbitals.
   - D: Depends on the mass of the nucleus.

7. **Hydrogen atom do not emit x-rays because?**

- A: Its energy level are too close to each other.
- B: Its energy level are too far apart.
- C: It is too small in size.
- D: It has a single electron.

8. **The electric potential energy of an electron in an orbit at a distance from the positive charge is?**

- A: $- Ke/r_n$
- B: $- ke/(r_n)^2$
- C: $- (ke)^2/r_n$
- D: $- ke^2/r_n$

9. **For the priciple of population inversion during laser emission, which of the following statement is true?**

- A: Electrons always remain in the metastable state.
- B: Electrons always remain in the ground state.
- C: Electrons stay longer in the excited state as compared to the metastable state.
- D: Electrons stay longer in the metastable state as compared to the excited state.

10. **What is the velocity of a particle of mass m and de-Broglie Wavelength ?**

- A: $h/m\lambda$
- B: $2h/m\lambda$
- C: $m\lambda/h$
- D: $m/h\lambda$

11. **The minimum wavelength of X-rays can furhter be reduced by ?**

- A: Reducing the pressure of cooling the target.
- B: Increasing the temperature of the filament.
- C: Using a target element of higher atomic number.
- D: Increasing the potential difference b/w the cathode and the anode.

TEST 4

1. When X-rays are passed through successive aluminum sheets, what happens to their thickness ?

- A: It increases
- B: It decreases
- C: Remains same
- D: Sometimes increases sometimes decreases

2. Radiation with wavelength longer than red light is called?

- A: Ultraviolet rays
- B: X-rays
- C: Infrared radiations
- D: Visible radiations

3. Which of the following can be used to produce population inversion for the emission of laser?

- A: Optical fiber
- B: Optical pumping
- C: Optical instrument
- D: Optical polarization

4. X-rays are similar in nature to?

- A: Cathode rays
- B: Beta rays
- C: Gamma - rays
- D: Alpha - rays

5. The penetrating power of x-rays depend on their ?

- A: Applied voltage
- B: Frequency
- C: Source
- D: All of the above

6. In hydrogen spectrum, which one of the following series lies in the ultraviolet region ?

- A: Balmer series
- B: Pfund series
- C: Lyman series
- D: Bracket series

7. Population inversion is the phenomena observed in?

- A: LASERs
- B: Balmer series
- C: compton Effect
- D: X-rays

8. A common He - Ne gas laser contain, He - Ne in the ratio?

- A: 80 - 20%
- B: 85 - 15%
- C: 70 - 30%
- D: 30 - 70 %

9. The radiations emitted from hydrogen filled discharge tube show?

- A: Band spectrum
- B: Line spectrum
- C: Continuous spectrum
- D: Absorption spectrum

10. Which of the following series has the highest frequency?

- A: Lyman series
- B: Balmer series
- C: Paschen series
- D: All have same frequency.

11. The value of Plank's constant is?

- A: 6.63×10^{-34} sec/J
- B: 6.63×10^{-34} J/sec
- C: 6.63×10^{-34} J.sec
- D: 6.63×10^{34} J/sec

12. Cathode rays are:

- A: Independent of the nature of gas.
- B: Dependent on the nature of gas.
- C: Depended on the target material.
- D: None of the above.

13. X-rays can be produced by bombardment of ________ on target metals:

- A: Electrons
- B: Protons
- C: Neutrons
- D: Alpha particles

14. Total number of series in hydrogen spectrum is?

- A: 3
- B: 4
- C: 5
- D: 6

15. The shortest wavelength of continuous X-ray, emitted from an X-ray tube, depends on:

- A: Current in tube
- B: Voltage applied
- C: Nature of tube
- D: Atomic number of target

16. The penetrating power of X-rays is comparable with that of ?

- A: α rays
- B: β rays
- C: γ rays
- D: None of the above.

NUCLEAR PHYSICS

TEST-1

1. Which one of the following will be better shield against gamma rays ?

- A: Ordinary water
- B: Heavy water
- C: Lead
- D: Aluminum

2. Subatomic particles are divided into how many groups?

- A: 3
- B: 4
- C: 5
- D: 6

3. One a.m.u is equal to ?

- A: 1.66×10^{-27} kg
- B: 1.66×10^{-25} kg
- C: 1.66×10^{-20} kg
- D: 1.66×10^{-19} kg

5. Equivalent dose of radiation is defined as?

- A: $D_e = D / RBE$
- B: $D_e = D * RBE$.
- C: $D_e = D^2 * RBE$.
- D: $D_e = D * RBE^2$.

6. CFC is used in ?

- A: Refrigerator
- B: Aerosol spray
- C: Plastic foam industry
- D: All of above

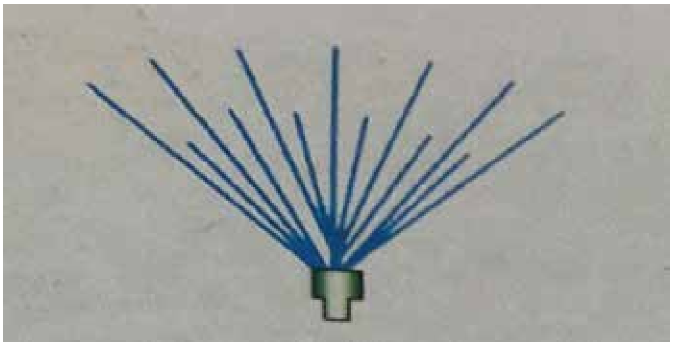
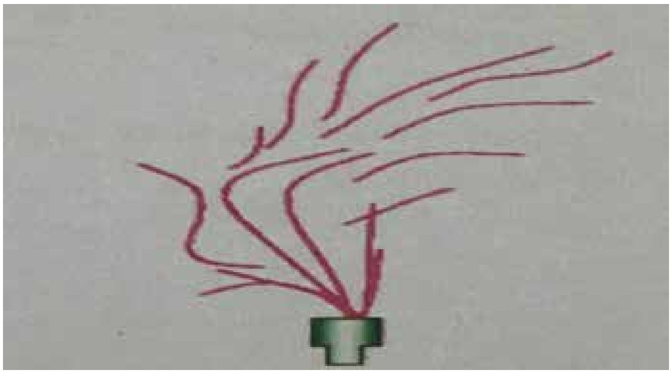
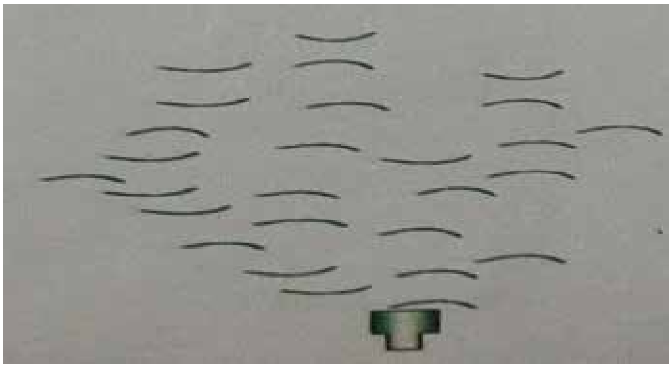
7. Sum of the masses of constituent nucleons as compared to the mass of the resultant nucleus is ?

- A: Smaller
- B: Greater
- C: Same
- D: Some times smaller some times greater

8. Electrons can exist?

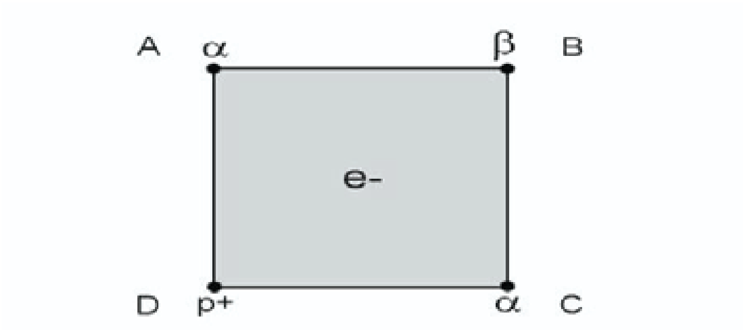
- A: Inside the nucleus.
- B: Cannot exist inside the nucleus.
- C: Can exist both inside and outside the nucleus.
- D: Electron existence inside or outside of nucleus depends on the isotope of the element.

4. In Wilson cloud chamber which of the following pattern represent beta particles?

- A: 
- B: 
- C: 
- D: All of the above

9. Mass of neutron is?

- A: 1.67×10^{-13} Kg
- B: 1.67×10^{-27} Kg
- C: 9.1×10^{-31} Kg
- D: 1.67×10^{-19} Kg



10. The two-dimensional cube in the diagram above has charged objects placed at the corners as shown. An electron that is free to move is placed at the exact center of the cube. In which direction will the electron move?

- A: It will move toward A.
- B: It will move toward B.
- C: It will move toward C.
- D: It will move toward D.

11. Mass defect is a phenomenon whereby?

- A: Mass of nucleus is greater than the total mass of individual nucleons.
- B: Mass of nucleus is less than the total mass of individual nucleons.
- C: Mass of nucleus is equal to the total mass of individual nucleons.
- D: Mass of nucleus is less than or equal to the total mass of individual nucleons depending on the properties of isotope.

12. The penetration power of beta-particle as compared to alpha-particle is ?

- A: 10 times more
- B: 100 times more
- C: 100 times less
- D: 10 times less

13. Average distance covered by alpha particles in a medium before coming to rest is called its?

- A: Ionization power.
- B: Limit.
- C: Decay potential
- D: Range

14. Which one of the following possesses highest penetrating power ?

- A: Alpha rays.
- B: Beta rays.
- C: Gamma rays.
- D: All of them have same penetrating power.

15. Unit of decay constant is?

- A: It has no units.
- B: Sv
- C: s
- D: s^{-1}

16. A particle having the mass of an electron and the charge of a proton is called?

- A: Antiproton
- B: Positron
- C: Gamma rays
- D: Photon

17. A carbon atom decays into a nitrogen atom in the equation below. Which of the quantities correctly finishes the equation?

$${}^{14}_{6}C \rightarrow {}^{14}_{7}N + ?$$

- A: Alpha
- B: Beta
- C: Gamma
- D: Neutron

18. Charge on alpha particle is?

- A: +1
- B: +2
- C: -2
- D: -1

19. Which of the following statements is correct?

- A: β-radioactivity is the process in which an electron is emitted from an unstable atom whose atomic number Z remains unchanged.
- B: ϒ-radioactivity is the process in which daughter nucleus has atomic number 1 unit more than that of parent nucleus.
- C: α-radioactivity is the process in which an unstable atom emits nucleus of helium atom.
- D: α -radioactivity is the process in which a heavy atom emits electromagnetic radiation of very high frequency.

20. How many major types of nuclear reactors are there?

- A: 2
- B: 3
- C: 4
- D: 5

TEST-2

1. Which of the following is the device to detect isotopes?

- A: Wilson Cloud chamber
- B: Geiger Muller counters
- C: Solid state detector
- D: Mass spectrograph.

2. A half-life of sodium-24 is ________ which is used to estimate the volume of blood in a patient:

- A: 15 hours
- B: 6 hours
- C: 8 hours
- D: 15 days

3. A sample of a radioactive substance has a half-life of 20 minutes. If the sample's activity is 200 counts/second, what is the number of counts/second after one hour passes?

- A: 6.25 counts/sec
- B: 12.5 counts/sec
- C: 25 counts/sec
- D: 50 counts/sec

4. Nuclear force exists between?

- A: Proton-proton
- B: Proton-Neutron
- C: Neutron- Neutron
- D: All of the above

5. A certain nuclei of mass number "x" decays by β-emission and α-emission to a second nuclide of mass number "t" which of the following correctly relates "x" and "t" ?

- A: x = t-4
- B: x = t +4
- C: x + 3 = t
- D: x-1 = t

6. Candela is the luminous intensity, in the perpendicular direction of a surface ______ square meter of a black body at the temperature of freezing platinum under a pressure of 101325 Newton per square meter

- A: 1/300000
- B: 1/600000
- C: 1/200000
- D: 1/500000

7. Half life of Radon is?

- A: 1500 years
- B: 23.5 mins
- C: 3.8 days
- D: 4×10^{789}

8. Which of the following radioactive isotope is used for studying blood isotopes?

- A: Carbon 14
- B: Cobalt 60
- C: Iodine 131
- D: Sodium 24

9. Sterlizations of surgical instrument, medical supplies and bandages can be done by exposing them to a beam of?

- A: a - rays
- B: b - rays
- C: y - rays
- D: "b" and "c" have equal antiseptic properties

10. In which of the following detectors impulse is independent of the energy of particle:

- A: GM counter
- B: Solid state
- C: Wilson cloud
- D: All of the above.

11. Moderators are used in Plutonium fission in order to?

- A: Slow down neutrons
- B: Speed up neutrons
- C: Create Alpha particles
- D: Control energy output.

12. For the radio therapy of patient it is required to double the absorbed dose in gray. What step should be taken?

- A: Energy must be quartered
- B: Energy must be halved
- C: Energy must be increased four times
- D: Energy must be doubled.

13. Besides Uranium 235 which other element is mostly used for the fission purpose?

- A: Barium 141
- B: Uranium 239
- C: Krypton 92
- D: Plutonium 239

14. Radio activity was discovered by?

- A: Marie Curie
- B: JJ Thomson
- C: Henri Becquerel
- D: S.A Wilson

15. Which of the following devices can be used for the fast counting of the radiation particles?

- A: Wilson Cloud chamber.
- B: Geiger-Muller counters
- C: Solid State detector.
- D: All of the above.

16. The safe radiation exposure limit for persons working in nuclear power station is ?

- A: 0.1 rem per week
- B: 1 rem per week
- C: 2 rem per week
- D: 3 rem per week

17. The binding energies for nuclei $_1H^1$, $_2He^4$, $_{26}Fe^{56}$, $_{92}U^{235}$ are 2.22, 28.3, 492 and 17.86 MeV respectively. The most stable nuclei is?

- A: $_1H^1$
- B: $_2He^4$
- C: $_{26}Fe^{56}$
- D: $_{92}U^{235}$

18. Range of the radiations depends on which of the following?

Charge and mass of the radiation particle

Density of medium

Ionization potential of atoms in the medium

- A: i only
- B: i and ii only
- C: ii and iii only
- D: i, ii and iii.

19. If M_0 is the mass of an oxygen isotope $_8O^{17}$, M_p and M_n are the masses of a proton and a neutron respectively, what is the nuclear binding energy of the isotope?

- A: $(M_0 - 8M)c^2$
- B: $(8M_p + 9M_n - M_o)c^2$
- C: $(M_o - 17M_n)c^2$
- D: M_oc^2

20. Among the three types of radioactive radiation, which have strongest penetration power?

- A: Alpha
- B: Gamma
- C: Beta
- D: Alpha, beta and gamma have same penetration

TEST-3

1. **Li nucleus has three protons and four neutrons. Mass of lithium nucleus is 7.016005 amu. Mass of proton is 1.007277 amu and mass of neutron is 1.008665 amu. Mass defect for lithium nucleus in amu is?**

   - A: 0.04002 amu
   - B: 0.04050 amu
   - C: 0.04065 amu
   - D: 0.04089 amu

2. **The bombardment of nitrogen with alpha particles produces oxygen and?**

   - A: Beta particle.
   - B: Alpha particle.
   - C: Neutron
   - D: Proton

3. **Iron is the most stable element because?**

   - A: It has highest binding energy.
   - B: It has lowest binding energy.
   - C: It has the highest number of neutrons in the nucleus.
   - D: Iron has shortest nuclei radius.

4. **According to the equation,** $^{4}_{1}X \rightarrow Y + 3\alpha$ **what are atomic and mass numbers of "Y" ?**

   - A: Z-6 , A-12
   - B: Z-2, A-4
   - C: Z+1, A
   - D: Z+3, A

5. **A radioactive nucleus decays and emit following radiations in the sequence (i) alpha rays (ii) beta rays (iii) alpha rays and finally (iv) gamma radiation. If the atomic weight and the atomic number of the parent element A are 180 and 72 then, what will be the atomic number and atomic mass of the final element in the sequence?**

   - A: 70, 172
   - B: 69, 171
   - C: 69, 172
   - D: 68, 172

6. **What is equivalent radiation in Sv for a 20 rad source? RBE = 3.**

   - A: 0.006 Sv
   - B: 0.6 Sv
   - C: 6 Sv
   - D: 600 Sv

7. Consider the following two statements A and B, and identify the correct answer.

A: In a nuclear reactor, cadmium rods are used to control the chain reaction, as cadmium slows down neutrons.
B: In the pair production, a high energy gamma ray, while passing through the strong electric field of a nucleus gives rise to an particle and an antiparticle.

- A: Both are correct.
- B: Both are wrong.
- C: Only A is correct.
- D: Only B is correct.

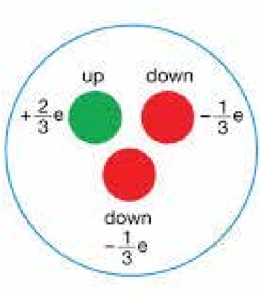
8. Various types of cancer are treated by?

- A: Cobalt 60
- B: Sodium 24
- C: Carbon 14
- D: Nickel 63

9. In mass spectrograph, mass of each ion reaching the detector is proportional to?

- A: $B/\sqrt{2}$
- B: B
- C: $\sqrt{2}B$
- D: B^2

10. The following figure shows the quark model for which sub atomic particle?



- A: Electron
- B: Proton
- C: Neutron
- D: None of the above.

11. What is equivalent dose in rem for a 15 rad source? RME for the radiation is 5.

- A: 0.075 rem
- B: 0.75 rem
- C: 75 rem
- D: 750 rem

12. For a chain reaction to buildup, the radioactive mass should be ?

- A: Less than the critical mass.
- B: Greater than the critical mass.
- C: Equal to critical mass.
- D: Greater than or equal to the critical mass.

13. The dead time of Geiger Muller counter is of the order of ?

- A: 10^{-1} s
- B: 10^{-2} s
- C: 10^{-3} s
- D: 10^{-4} s

14. In a sample of radioactive material, what fraction of the initial number of active nuclei will remain undisintegrated after half of a half-life of the sample?

- A: 1/2
- B: 1/4
- C: $1/2\sqrt{2}$
- D: $1/\sqrt{2}$

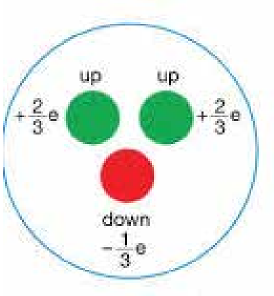
15. Which of the following is true about the strong nuclear force ?

- A: It increase with magnitude of increasing charge
- B: It decrease with magnitude of increasing charge
- C: Is independent of charge
- D: Only works between proton-proton pair.

16. Which of the following is the correct relationship between the intensity of gamma radiations (X) and distance from the source (D)?

- A: $X \alpha 1/D$
- B: $X \alpha 1/\sqrt{2}D$
- C: $X \alpha 1/D^2$
- D: None of the above.

17. The following figure shows the quark model for which sub atomic particle?



- A: Proton
- B: Electron
- C: Neutron
- D: Baryon

18. The radioactive decay of an element X into elements Y and K is represented by the equation:

$$_{z}X^{A} \text{ --> } {}_{z-2}A^{A-4} \text{ --> } {}_{z-2}A^{A-4} \text{ --> } {}_{z-1}C^{A-4}$$

The sequence of the emitted radiations is?

- A: α, β and ϒ
- B: β, ϒ and α
- C: α, ϒ and β
- D: ϒ, α and β

19. Activity of a radioactive sample decreases to (1/3)rd of its original value in 3 days. Then, in 9 days its activity will reduce to?

- A: 1/3 of the original value.
- B: 1/9 of the original value.
- C: 1/18 of the original value.
- D: 1/27 of the original value.

20. The nucleus $_{92}U^{234}$ splits exactly in half, in a fission reaction, in which two neutrons are released. The resultant nuclei are?

- A: $_{46}X^{116}$
- B: $_{46}X^{117}$
- C: $_{44}X^{116}$
- D: $_{44}X^{117}$

TEST-4

1. **Which of the following basic forces is short range?**

   Weak nuclear forces

   Strong nuclear forces

   Gravitational force

   - A: i only
   - C: i and ii only
   - B: iii only
   - D: ii and iii only

2. **The half life of radioactive element is 1500 years, the fraction of sample that is left after 6000 years is?**

   - A: 1/2
   - C: 1/8
   - B: 1/4
   - D: 1/16

3. **A mass spectrograph sorts out?**

   - A: Molecules
   - C: Elements
   - B: Ions
   - D: Isotopes

4. **The energy obtained in a nuclear reaction is derived from**

   - A: mass defect and binding energy.
   - B: fission.
   - C: fusion.
   - D: all of these.

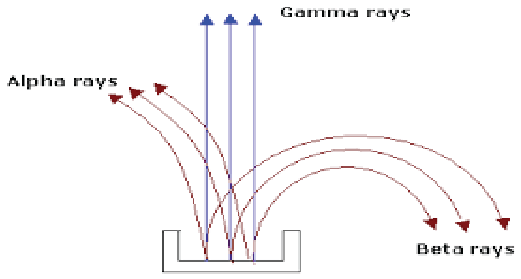
5. **Which of the following radioactive element is used as tracer in the plants?**

   - A: Carbon 12
   - B: Carbon 14
   - C: Cobalt 60
   - D: Iodine 131

6. **Emission of alpha decay from a radioactive substance causes:**

   - A: Decrease in 'Z' by 4 and decrease in 'A' by 2.
   - B: Decrease in 'A' by 1 and 'Z' remain same.
   - C: Decrease in 'Z' by 1 and 'A' remains same.
   - D: Decrease in 'A' by 4 and decrease in 'Z' by 2.

7. **In a radioactive phenomenon observation shown in the figure where α deaviates lesser than β in some electric or magnetic fields (not shown in figure). What is the reason of less deviation of α?**



   - A: α is charged particle
   - B: α is neutral particle
   - C: α is lighter particle
   - D: α is heavier particle

8. Half life of four elements is given as A: 12 hours; B: 5 days; C: 3 years; D: 18 years. Which one of them has highest decay constant?

- A: A
- B: B
- C: C
- D: D

9. In cloud chamber , the path of β-particles is:

- A: Straight, thick, short
- B: Thin, wavy, shorter
- C: Thin, wavy, longer
- D: Thin, wavy, short

10. Radioactive materials can be identified by measuring their?

- A: Hardness
- B: Density
- C: Half Life
- D: All of the above.

11. Charge on an electron was first determined by?

- A: Ampere
- B: Maxwell
- C: Milliken
- D: Thomson

12. Which of the following is the unit of absorbed dose?

- A: Gray
- B: Severt
- C: Roentgen
- D: Curie

13. A radioactive substance disintegrates for 4 hrs and its $1/16^{th}$ part remains undisintegrated. What will be the half life of the element?

- A: 0.5 hrs
- B: 1 hr
- C: 2 hrs
- D: 4 hrs

14. Isotopes of the same element have?

- A: Different number of electrons.
- B: Different number of protons.
- C: Different number of neutrons.
- D: Different chemical properties.

15. Average energy required to break up a nucleus is?

- A: Greater than the energy released by the mass defect during its formation.
- B: Less than the energy released by the mass defect during its formation.
- C: Equal to the energy released by the mass defect during its formation.
- D: Could be greater or less than the energy released by the mass defect during its formation.

16. Radio isotopes can be made easily by the bombardment with ?

- A: Electrons
- B: Protons
- C: Neutrons
- D: All of the above.

17. If 200 MeV energy is released in the fission of a single nucleus of $_{92}U^{235}$, how many fissions must occur per second to produce a power of 1 kW?

- A: $3.12 * 10^{13}$
- B: $2.81 * 10^{15}$
- C: $4.38 * 10^{15}$
- D: $8.42 * 10^{17}$

18. An element $_{86}R^{220}$ decays to a new element S by emitting two alpha-emissions, the nuclide S is ?

- A: $_{84}S^{212}$
- B: $_{82}S^{212}$
- C: $_{80}S^{220}$
- D: $_{84}S^{216}$

19. If A is mass number and Z is the atomic number then mass defect is given by? m_p and m_n are the mass of the proton and neutron respectively.

- A: $\Delta m = Zm_p + (A-Z)m_n - M_{nucleus}$
- B: $\Delta m = Zm_p + (A + Z)m_n - M_{nucleus}$
- C: $\Delta m = Zm_p + (A-Z)m_n + M_{nucleus}$
- D: $\Delta m = Zm_p - (A+Z)m_n + M_{nucleus}$

20. Which one of the following has largest energy content?

- A: Gamma rays
- B: X rays
- C: Infrared rays
- D: UV radiations